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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Twenty-ninth Annual Meeting, American Gas Light Association.

OFFICE OF THE SECRETARY,
NEW YORK, Sept. 10th, 1901.

There will be an annual meeting of the American Gas Light Association held at Boston, Mass., October 16th to 18th, 1901.

The meeting will be called to order by the President, Mr. Edward G. Pratt, of Des Moines, Ia., at 10 A.M., on Wednesday, October 16th.

The meeting hall will be Steinert Hall, Boylston street, near Park square, Boston, Mass.

The headquarters will be at the Hotel Brunswick, corner Boylston and Clarendon streets, Boston, Mass.

The most satisfactory quarters are always obtained by writing in advance to the hotel people, and in doing so a reply should be requested, for which a self-addressed, stamped envelope should be inclosed, as misunderstandings may thereby be averted.

The Hotel Brunswick is conducted on the American plan, and rates for rooms will be as follows:

Rooms without bath, occupied by one person, $4 per day; occupied by two persons, $3.50 per day for each person. Rooms with bath, occupied by one person, $5 per day; occupied by two persons, $4.50 per day for each person.

While the Brunswick prefers not to take any of the members of the Association on the European plan, and has not made any rate on this plan, members who are especially desirous of adopting it may be able to make special arrangements by communicating with the hotel management.

The Lenox Hotel, corner of Boylston and Exeter streets, makes the following rates on the European plan: Single rooms, $1.50, $2 and $2.50; single rooms with bath, $2.50, $3 and $3.50. Double rooms, $2.50, $3 and $4; double rooms with bath, $3, $3.50 and $5. Both hotels are within 5 minutes' walk from Steinert Hall.

Other hotels at Boston are as follows: Copley Square Hotel, Huntington avenue and Center street; Hotel Thorndike, Boylston and Church streets; Hotel Touraine, Boylston and Tremont streets; Adams House, Washington street, south of West street; Parker House, Tremont and School streets; Young's Hotel, Court street.

The Roll Call will be made by means of the door card system. Each member upon entering the hall for the first time will at the door receive a special card upon which he will find his name, address, etc., as on the Secretary's books, and such card should be corrected and given to the doorkeeper. Members in attendance should attend to this very carefully, as these cards are used immediately after the meeting for correcting the annual membership list. Visitors will please hand to the doorkeeper their personal cards.

A blank form of application for membership accompanies this circular. More can be obtained of the Secretary. Remember, all applications must be in the Secretary's hands by October 6th, at the very latest, otherwise they will not be acted upon at this meeting.

The list of papers to be read at the meeting is as follows:

"The Analysis of Gas Accounts," by Mr. Paul Doty, Detroit, Mich.

LIBRARY OF CONGRESS
SEP 30 1901
SMITHSONIAN DEPOSIT.

"What is a Gas Company's Business?" by Mr. Frank D. Moses, Trenton, N. J.

"Tar and Water from Water Gas," by Mr. Wm. E. McKay, Dorchester, Mass.

"Retort Ovens as Producers of Illuminating Gas," by Mr. T. Littlehales, Syracuse, N. Y.

"Further Notes on Retort House Practice," by Mr. E. H. Earnshaw, Philadelphia, Pa.

A paper by Mr. A. B. Slater, Jr., Providence, R. I., and a paper by Mr. C. F. Prichard, Lynn, Mass. The titles of these last 2 papers have not yet been announced.

If the papers are of a sufficiently high standard the Beal Medal will be awarded to the author of the best paper presented; the question of which is best to be decided by the proper committee.

The officers are endeavoring to arrange for a lecture on some subject of interest to the members to be delivered during the meeting.

In addition to the papers and lecture, the Report of the Research Committee will deal with the question of "Pipe Standards" referred to the Committee at the last meeting, and with other subjects that should give rise to a good discussion.

During the days of the meeting all the announcements will be posted on the bulletin boards in the hotel. All members are warned to take notice thereof accordingly.

All members attending the meeting are particularly requested to wear their membership badges in plain sight, thereby greatly aiding the officers and the local committee in their work, by affording a ready means of recognition.

In order that the "Year-book" containing the report of this meeting may be published and issued to the members immediately after the meeting, notice is hereby given that, if any of the speakers at this meeting desire to correct their remarks before they are printed, they will be given an opportunity before leaving Boston, Mass., but not after. The stenographer will have typewritten copy of the principal discussions prepared at the headquarters between the sessions of the meeting, and all those who desire to correct their remarks must notify the Secretary at the close of the session at which such remarks are made, as all the reports will be turned in to the printer immediately after the adjournment of the meeting.

The arrangements for the entertainment of the members and the ladies accompanying them during the meeting have not yet been completed. The entertainment will, however, include a banquet at the Brunswick, the evening of Thursday, October 17th, and an excursion of some kind on Friday, October 18th. It is also probable that the ladies will be taken on a trip around Boston, during which they will be in charge of a thoroughly competent guide and be shown all the places of historic interest. A complete programme of the entertainment will be given in an announcement to be sent out later.

Any members having questions which they desire to put into the Question Box should send the same to the Secretary as soon as possible, in order to give him an opportunity to have them printed and distributed to the members before the meeting so as to secure for them careful attention.

ALFRED E. FORSTALL, Secy.

BRIEFLY TOLD.

PROPOSED LIBRARY AND INFORMATION FUND, WESTERN GAS ASSOCIATION.—Too late for extended comment thereon in our current issue came to hand the appended official notices from Secretary Dunbar of the Western Gas Association, which fully explain themselves. At present writing we may declare that we are heartily in accord with the plan, the value and worth of which must appeal to every gas man; and we may further say that the JOURNAL enters itself upon the subscription lists as an annual subscriber in the sum of $40 for the period named. The communications of Secretary Dunbar are as follows:

WESTERN GAS ASSOCIATION,
OFFICE OF THE SECRETARY,
NEW ALBANY, IND., Sept. 23d, 1901.

To the Editors AMERICAN GAS LIGHT JOURNAL: Inclosed please find copy of letter that is being mailed to all members of the Western Gas Association, with the request that they submit the same to their respective companies and endeavor to secure the financial co-operation which is necessary to make the proposed work a success. While the work is primarily on behalf of the Western Gas Association, it is nevertheless realized that the more money that is received the better the work can be put through; hence it has been arranged that subscriptions will be received and appreciated from other gas companies than Western members that may desire to subscribe.

It is earnestly hoped that gas companies who have no representatives members of the Western Gas Association, will realize the importance o the work proposed, and aid by subscribing the amount suggested, whic will entitle them to the benefits obtainable.

It is desirable that subscriptions be promptly made so that there wil be as little delay as possible in the commencement of the work.

Subscriptions should be made to the undersigned, who will be pleased to furnish any further information desired.

It is expected that the work will be started at once, and that subscribers will receive the first results in the shape of indexes and collections of current gas literature, etc., quite promptly, the records of back literature duly following. Yours very truly,

JAMES W. DUNBAR, Secy.

WESTERN GAS ASSOCIATION,
OFFICE OF THE SECRETARY,
NEW ALBANY, IND., Sept. 24th, 1901.

To the ..... Gas Co.

.....

Gentlemen: At the last annual meeting the Western Gas Association decided to build up and maintain an Association Library (using the Thompson Memorial Library as a nucleus), and to inaugurate a systematic method for getting to the members information upon gas subjects of every description. A Library Committee was appointed and given extensive powers in the matter.

The Committee feels that a principal feature of a gas library and central "Information Bureau," so-to-speak, should be a complete index of all the printed and reference data published upon any and all gas topics, subject matters, etc. The result would be that any Association member looking up, say, regenerative benches, naphthaline, opposition companies, fuel, gas, ammonia, etc., etc., or any matter whatever, would find a record of everything that has been printed on the subject, saving him much time in investigating and giving him much information that would doubtless otherwise be overlooked. The importance of such information in readily accessible form needs scarcely any argument. In some cases it would prove invaluable.

Mr. Frederic Egner, well known and esteemed as a member and ex-President of the Western Association, has been selected as one peculiarly suited to the making of the index of gas literature proposed, and has kindly offered to undertake the work. It is work; for the examination of the American and English gas journals for many years back, and other publications, books, etc., will take—for the full indexing—probably 2 or 3 years.

The Western Gas Association, on its present basis of dues, is unable alone to appropriate enough to carry out the work. It has been proposed, therefore, that the index be made with duplicates, and that gas companies be invited to subscribe for it, each company so subscribing to receive copies direct of the parts of the index as issued from time to time. It is felt that if a number of companies would so subscribe and agree to pay per year say:

For companies putting out less than	.....	20 millions	feet per year..	$10
"	"	between 20 and 50	"	"	"	.. 20
"	"	" 50 " 100	"	"	"	.. 30
"	"	" 100 " 200	"	"	"	.. 40
"	"	" 200 or over,	"	"	"	.. 50

for the term of 3 years, that enough money will be available to put the matter through and in good shape.

It is earnestly hoped that you will so subscribe, and thus co-operate in this proposed work, that is felt will be of the utmost practical value to every subscriber, as well as marking a great work inaugurated and it is believed that will be done—by the Western Gas Association.

Subscriptions and remittances should be made to the Secretary.

Very truly,

WM. MCDONALD,
F. H. SHELTON,
O. O. THWING,
THOS. D. MILLER,
JAMES W. DUNBAR,
} Committee.

NOTES.—Mr. Elliott P. Gleason, founder of the E. P. Gleason Manufacturing Company, which was incorporated in this city in 1871, and which is known through its trading in gas burners the world over, died at his home, 152 Calyer street, Brooklyn, N. Y., the morning of last Friday. He was in his 81st year.——The project for the establishment of a municipal gas plant at Waterville, Minn., has been defeated by formal vote of the taxpayers.——With much regret we are compelled to report the death of the estimable wife of President Henry Morton, of the Stevens Institute of Technology, who died at their summer residence, Pine Hill, N. Y., last Monday. Deceased, who was united in marriage to President Morton in 1863, was a woman of great attainment and refinement. President Morton and 2 sons survive her.

The Construction of Inclined Retort Carbonizing Plants.

[A paper read by MR. WALTER RALPH HERRING, of Edinburgh, Scotland, before Section VIII., International Engineering Congress, Glasgow, Sept., 1901.

The subject which the author has the honor of bringing before the attention of this section of the International Engineering Congress, is one that may be said to be familiar to all, and needs neither introduction nor much time being spent upon the elementary definitions of the purposes and objects sought to be achieved, and how best to accomplish the same. Suffice it, therefore, to say that these aspects of the question have been somewhat fully dealt with by the author on former occasions —once in the paper which he read before the Royal Scottish Society of Arts in March, 1900, and again in the paper which he read at the annual meeting of the North British Association of Gas Managers in July of the same year.

The primary object of the process is the reduction to a minimum of the labor hitherto involved in the charging and drawing of coal gas retorts, by employing simple and reliable mechanical devices for manipulating the material to be dealt with, and by taking the fullest advantage of the natural force of gravity to charge and draw the retorts when set upon a plane inclined to the horizontal line. There are other secondary advantages—such as the greater producing capacity over a given area of land, economy in construction, etc.—but as these questions are influenced by local circumstances and the individuality of the designer, they may, for this occasion, be set aside, and the question considered broadly with a view of settling the doubts which even to-day are openly expressed as to the unsuitability of the system when certain classes of coal are to be dealt with. The gathering together of men from all parts of the world at this Congress appeared to the author to be an excellent opportunity for gleaning the opinions of all such on this particular point, seeing that so many of our Continental *confrères* use the same coal as ourselves, and such as is alleged to be unsuitable by some in our own country, but which, as far as the author has been able to judge from observations of the Continental installations, appears to work in a most satisfactory manner abroad.

Considerable variety is shown in the outward form of the different plants existing in this country, as contrasted with the various installations upon the Continent of Europe. A great uniformity is discernible in the Continental installations, owing probably to the fact that, with few exceptions, the plants have been erected by the same contractors. The author is not prepared to suggest that this has not been generally advantageous to all parties. The Continental constructors in the first instance had the advantages of the earlier experience of the various installations that were erected in this country, and were able to avoid the defects which had manifested themselves in many of the English plants —so much so, in fact, that it would be difficult to find a plant on the Continent that is not working equally as satisfactorily as the best English designs, and working, be it remembered, with the very same coal as is alleged by some English engineers to "creep" and slide to the lower end of the retorts, and thus be impossible of being utilized in inclined retorts.

Another distinctive feature of the Continental installations is the length of the retort. The Britisn practice may be said to be 20-foot retorts, where space permits of their adoption; whereas on the Continent from 3 to 3½ meters (10 feet to 11 feet 6 inches) is the predominant length of the retort. The only installation in this country, of which the author has any knowledge of approaching the Continental length, is one which was erected at Leigh, in Lancashire, where 12 feet 6-inch retorts were put in. This bench, however, was leveled to the ground, and reconstructed as 20-foot retorts, some few years after its first introduction.

The author, in his erections at Huddersfield, put in 15-foot retorts; the available space not permitting of anything longer. The fact of the majority of the British installations being 20 foot is, however, in the author's opinion, sufficient to prove that there can be no doubt as to their efficacy, and also their utility. There certainly cannot be any question as to their economy, both from a constructional and also from a manufacturing costs point of view. The one producer, the one set of mouthpieces, pipes, hydraulic mains, etc., are required for the shorter, the same as for the longer retorts.

The increased capacity of the hoppers necessitates but a small percentage in the additional weight of their structure; and from a labor point of view, the operation of charging a 20-foot retort with 7 cwt. of coal is no greater, and occupies but a few seconds more, than the charging of a retort from 12 feet 6 inches to 13 feet long. Under the circumstances, therefore, it will be highly interesting if our Continental friends will disclose to us their reasons for adhering to the shorter retorts.

The inclined retort installations at the present time may, broadly speaking, be defined as consisting of two distinct types, with considerable variety of outward form, and yet similarity of design so far as the details of the various parts common to each are concerned.

The best known type is that having continuous coal-storage hoppers (sub-divided or not) erected above the benches, with or without measuring chambers beneath, but more commonly with the measuring chambers attached to the underside of the storage hoppers.

The other distinctive type has one or more coal storage hoppers centralized; the charging shoot forming also the measuring chamber, receiving its charge from beneath the hopper, and traversing with it to the retorts to be charged. The author throughout has been a staunch advocate for the continuous storage hopper, with or without the measuring chamber beneath; his reason being that they must, in the first instance, mechanically handle the coal, in order to get it to the required elevation for charging the retorts by gravity. As this is a necessity, it is as easy to deposit the coal in exactly the position required for charging the individual retorts, by distributing it in a long continuous hopper running the entire length of the bench, as to deposit it in a large hopper localized, but not necessarily running the whole length of the bench. The latter necessitates the employment of additional labor to transfer the coal from the storage hopper to the particular retorts to be charged. There is also considerable loss of time in handling the charging appliances, as the charger has to carry the charge a certain distance in the retort house; whereas in the former case the coal is immediately above the retort to be charged, and the charger has simply to direct the current into the retort. The same weight of coal must be stored in either system; and the greater the bulk stored over a given area, the greater strength is required in the construction of the hopper and its supporting structure. Continuous hoppers need not be more than ¼ inch thick, properly stayed, extending continuously for the length of the retort bench, with the measuring chambers suspended beneath them.

With this system, the coal, which must in the first instance be handled mechanically, is delivered at the very point where it is required to be used; and no further handling of the material takes place. With the other type, the coal is, in the first place, handled mechanically, and discharged into the storage hopper wherever it may be. From this point it is traversed by hand to the particular retorts into which it is to be charged. No argument in the world can convince one that this can be done as cheaply as with the coal lying immediately above the retort to be charged. In the first type mentioned the coal is conducted to the retort by means of a lightly constructed shoot traversing upon rails suspended from above; and by means of the various checking devices the stream of coal is fed into the retort. In the second type, the charging shoot must be constructed sufficiently strong to carry the weight of the charge in addition to itself, and permit of its being traversed; the tramway above being also more strongly constructed to carry the additional weight. In the one case, the charging shoot receives the charge, and is traversed along a more or less lengthened distance of the retort bench face by hand labor; while in the other, the charging shoot merely conducts and directs the coal into the retort to be charged. There are, perhaps, other modifications of these two types—such as the displacement of the measuring chamber by having the conducting shoot sufficiently large to contain the necessary weight for one charge. This, of necessity, is somewhat heavier, but insignificantly so as compared with the charger which also carries and traverses its load. These, however, are insufficiently defined to require consideration at this stage.

The author has always been somewhat puzzled to know what train of reasoning brought into existence the central storage hopper as distinct from the continuous hopper system. As regards structural cost, it is certainly no cheaper, if as cheap; and (as already shown) it cannot be as economical in the daily operations to be performed. Its advocates, it is to be hoped will take advantage of the present occasion to give the gas industry the benefit of their reasons for adopting the system.

The charging appliances, or the means used for conducting the coal into the mouth of the retort, have a most important influence upon the successful working of the system. The many varieties of coals that have to be dealt with—from fine dust, wet and dry, to mixed coal and on to round nuts—has brought into existence all sorts of devices whereby the charge can be regulated so as to flow into the retorts at a uniform and even speed, and insure a perfectly level and uniform charge throughout the length of the retort.

There are in these also distinctive features illustrative of either of the two types of plant previously referred to. Generally speaking, in

the case of type A—viz., the continuous hopper system—the coal is allowed to drop from the base of the measuring chamber and is checked in its descent by the adjustable sloping valves or balanced flaps within the charging shoot. The traversing charging shoot working in conjunction with the centralized hopper, or type B, has first to be charged from the hopper and then to carry its charge to the retort, where it discharges from its base on to the mouth of the retort; the base of the shoot being set approximately at the angle at which the retorts are set, a valve being opened, and the coal, by its natural inclination, sliding into the retort. Again, bearing in mind the many varying classes of coal with which we have to deal, it has always appeared to the author that this charging appliance is deficient in positive force. The coal receives its impetus from its natural tendency to slide from the sloping base of the shoot—an angle which is unalterable; the coal, as a matter of fact, sliding on itself in its effort to pass through the valve opening. It will be agreed that the coal, having differing physical characteristics, will act differently under these fixed circumstances of angle of discharge; and as there is no positive power in existence with this appliance, it is not surprising that it is now being regarded as of doubtful utility simply as a charging appliance. Assume, for instance, the worst case possible (which is the proper way of looking at these points) and that the shoot has been filled from the overhead hopper with a charge of fine, wet slack. If the angle of the base is suitable for ordinary coal, it must fail under such conditions to act efficiently. No doubt, the average class of coal can be made to work fairly satisfactorily with it; but there is a wide range in the physical characteristics of clean nut coal and the class previously mentioned. For these reasons, therefore, the author has always preferred to retain within his reach, figuratively speaking, the power of sending the charge of coal direct into the retort and over the bottom mouthpiece stop, and adopt means to govern the impetus of the coal by simple devices to suit all the various conditions of the physical characteristics of the coal to insure a uniform charge.

To accomplish this, the author found it necessary, in the first instance, to have some control of the aperture or the area of the point of discharge of the coal from the measuring chamber. In other words, that the total charge should pass out of the measuring chamber in a given time irrespective of the character of the coal itself. By inserting a sliding valve in the base of the measuring chamber, the area can be governed at will. It will be admitted, assuming the principle to be right, that the coal should discharge from the chamber in a given time, that the nut coal will require a smaller area to discharge itself within that time than a charge of small and damp slack. Between these grades various degrees exist. This valve was first inserted into the measuring chambers of the second installation at Huddersfield, and was found to be of very great service indeed; the regulation of it being operated from the top of the retort bench, and in the hands of the stage foreman only.

It may, perhaps, be remarked that the author has never been one of those fortunate individuals who have had but one or two classes of coal to deal with. During his expeeience with inclined retorts, he has never had less than 11 different descriptions being delivered at one and the same time; these proportions varying to as many as from 17 to 18 different classes. So it must be admitted that his remarks are founded upon a general experience with many classes of coal, confirmed by lengthy experiments with one coal over extended periods in experimental settings. The author thinks it necessary to make this statement at the present stage, in order that no misunderstanding may arise as to his opinions being founded on other than practical experience.

Reverting now to the charger used in conjunction with type A, its primary purpose is to conduct the coal from the chamber to the retort. Mounted upon a light carriage, it is made to run along a light overhead railway, and must be fitted with an adjustable shoe-piece that can be moved in and out of the retort mouthpieces, moving either horizontally in and out or by raising and lowering the outer end sufficiently to permit of the lip clearing the mouthpieces and buckstays. Separate chargers are employed for each horizontal row of retorts. There is no virtue in this, beyond practical utility. Each row of retorts being on a different level necessitates a longer body to each, and consequently a longer drop for the coal, with its accelerated impetus. This impetus must be governed; and many devices have been introduced to accomplish it, most of which are successful so long as a minor degree of intelligence is exercised in their employment. They must, however, be regulated to suit the physical characteristics of coal coming to hand from time to time; and this is best left to one man to do. The most successful device is the compound flap hinged within the body of the shoot, and adjusted by levers from the outside set at such an angle as to check the impetus by thinning the stream of descending coal and directing it into a uniform layer upon the base of the shoe of the charger. Any interference with this flow within the shoe is fatal to good charging. For the longest shoot more than one set of hinged checks are advisable. In all cases, however, their proportions must be such as to prevent the area of the body of the shoot being reduced to such an extent as to choke the passage way. The body should be as wide as the retort will permit, and rectangular in section, so as to draw the coal into a stream similar to the form it is to take in the retort.

The author has recently thought that it will be advantageous to have the means of altering the angle of the shoe-piece of the shoot. With the original installations, this was accomplished by telescopic arrangements, attached to the body of the shoot, raising and lowering a hinged shoe. This class of shoot gave very considerable trouble, not in consequence of the angle of the shoe being adjustable, but because of the means that were adopted to make it so, and the power necessary to put the shoe into the lip of the mouthpiece; the whole shoe being hinged, and requiring very considerable labor to lift it and place the lip upon the mouthpiece of the retort. The charger was, therefore, generally speaking, abandoned for those having a traversing shoe-piece, so as to run in and out of the mouthpiece. This, however, necessitates the employment of a fixed angle for the shoe, which from experience the author is prepared to say is wrong; and, in order to overcome it, he has introduced a means of adjusting this angle of the shoe, which will be illustrated and referred to when describing the latest installation at Edinburgh.

Up to this stage, the introduction of the inclined retort may be said to have accomplished a very great deal in the economy of gas manufacture; but from this point, the author does not claim that much economy is brought about, excepting perhaps in the physical force exerted by the operatives.

The discharging of the coke from the retorts cannot claim to be automatic. With new retorts it is sometimes so, but cannot be relied upon to a greater degree than 50 per cent.; and although the discharging by manual labor is comparatively easy, the expenditure is the same as though the men were being hard worked.

Tapered retorts were introduced to overcome this defect; but from experience with both tapered and parallel retorts, the author is not able to appreciate the advantages sufficiently to warrant his again introducing them elsewhere. The taper retorts also interfere with the uniform area of the heat passages in the setting, as well as reducing by nearly 10 per cent. the carbonizing area of the setting. In the author's opinion, the shape, or cross section, of the retort has far more to do with the question of automatic discharging than its parallel form.

In a paper contributed to the North British Association meeting in July, 1900, the author dealt fully with this matter; and he is of opinion that the cross section of the retort should be of such a form as to permit of the expansion of the coal in the retort rising without jamming itself into the arch or crown of the retort, and that this formation must be continued to the outer lip of the cast iron mouthpiece. With such a form, the process will become as near automatic as it is possible to have without introducing additional mechanical devices.

This, however, can easily be done; and the author is making preparations for it in the Granton erections by having a hydraulic, or compressed air, piston working in and out of the retort from the upper side, arranged with an accelerating motion so that the piston head will, upon entering the retort, start very slowly and gradually increase in speed, descending from 8 to 10 feet into the retort; thus giving the charge the necessary impulse to traverse down the slope of the retort. When once set in motion, there is not much chance of it again coming to a state of repose. This appliance is to be mounted upon a light traversing carriage, arranged with raising and lowering devices, so that one cylinder can be raised and lowered to serve the three rows of retorts.

The manipulation of the slides of the measuring chambers, or the valve at the base of the storage hopper, necessitates a very great amount of physical force to insure their uniform and regular working, as well as requiring considerable structional additions to carry the levers, frames and shafts associated therewith. The author has endeavored to not only simplify this structurally, but also to minimize the physical exertion demanded from the operatives. This he has accomplished by introducing a small double-acting cylinder and piston bolted to the underside of the coal storage hopper, and attached to the sliding valves governing the discharge opening from the hopper. And in the case of measuring chambers, the usual single lever is introduced to actuate the bottom slide. The diagrams on the wall are sufficiently clear to illustrate the general arrangements of the structure for the application of these cylinders for the purposes in view. A simple multiple hydraulic valve is fixed upon the stage of the retort bench, and made to work

groups of cylinders, in the case of the two retort settings at New street, Edinburgh. One multiple valve is made to work six cylinders actuating six measuring chambers. It is the author's intention, however, to group them into sets of 12. A single stroke of the lever permits of the operation of one chamber discharging, and the reversal of the lever again closing the valve of the chamber and the hopper. The whole operation requires no more exertion than can be exercised by a child. It will be seen from the diagram that considerable simplification of the structure is rendered possible by these arrangements, as compared with the hand worked system; and I may say that the hydraulic cylinders, with their valves and accessories, are less costly per retort than the arrangements hitherto employed.

The author also desires to draw attention to the fact that the coal storage hopper is made to carry itself, instead of being supported, upon longitudinal girders and angle irons spanning the space between the transverse ties attached to the inner buckstay heads; the cross section of the hopper shown on the diagram being the same throughout its entire length. The measuring chambers are bolted to, and suspended from, the base of the hopper, instead of being supported upon two channel irons, which received their support from the transverse girders which formerly carried the framework for supporting the hand-lever arrangements.

The accumulation of tar and other condensable matters in the lip of the lower mouthpieces—brought about, in the author's opinion, from the long length of the front ascension pipes condensing the vapors ascending with the gas—often renders the drawing stage mouthpieces a most unsightly spectacle, as well as involving considerable labor in the cleaning of the mouthpieces, levers, and mechanical parts. This condensation, no doubt, greatly assists in keeping the pipes clear; but to overcome the annoyance, the author is introducing a traversing screen, resting upon light rails bracketed to the front buckstays, each screen being sufficiently long to span the length of three retorts, and direct the coke and tar, and anything falling from the mouthpieces, directly into the shoot conducting the coke into the coke-conveyor trough.

The great improvements that have been made recently in the construction of conveyors for the transportation of hot coke, render it now possible to introduce these appliances for the removal of the coke from the retort house as it is discharged from the retort mouthpieces; the trough being placed preferably beneath the floor, and arrangements made therein for the quenching of the coke and the withdrawal of the foul gases and steam through a duct, and discharging them above the retort bench level. Considerable disappointment was occasioned upon the original introduction of these appliances in many works. This, the author thinks, arose primarily from the want of a sufficiency of substance and employment of proper metals in the parts composing the conveyor; many of these constructions being more of a tinsmith's job than a piece of engineering work. Experience, however, proved the necessity of very substantial work. Suppliers of these conveyors have risen to the occasion; and there are now one or two really first-class appliances of this character on the market, and such as can be depended upon for doing their work with a minimum of wear and tear and a very great degree of reliability.

The author prefers the cast iron trough and roller chain type of conveyor, the trough suspended beneath the floor joists being entirely covered in on the drawing stage level, with portable covers for opening immediately in front of the retorts to be drawn; perforated pipes being fitted within the trough, and a tap regulating a section in front of each retort setting. Coke, on being drawn from a given setting, meets with the water when it comes opposite the next but one setting. By this means, the steam and products emitted during the quenching of the coke are drawn through the conveyor trough forming its own duct, and up vertical shafts at the ends of the bench. The traversing screen or shield should be used in front of the retorts to protect the men from the direct heat rays of the discharging coke. It also acts as a shoot to direct the stream of coke to the aperture leading to the coke conveyor beneath.

The improvements in the construction of coke conveyors render it possible to abandon the stage floor retort house altogether; having the producer on the inner side, or preferably self-containing gas producers situated at a convenient point for feeding with coke, and the conducting of the fuel gas to the retort setting through brick lined conduits. This opens a very large field for economy in construction; and although the self-contained producer has been tried in many instances without any striking success, the author is of opinion that there can be no doubt of its ultimate adoption in the heating of coal gas retorts, the same as is used in many other industries.

Time will not permit of any elaborate description of the work now approaching completion at the new Edinburgh Gas Works. The diagrams on the wall are cyphered in sufficient detail to render an elaborate description unnecessary, and will doubtless, when published, prove sufficiently clear in themselves. The plant is designed to carbonize 1,000 tons of coal per 24 hours, and consists of 504 20-foot retorts, 22½ inches wide by 15½ inches deep, in cross sections, set in settings of nines, and divided into four complete benches, each bench having two short chimneys, one at either end. The width of the charging stage is 25 feet; and that of the drawing stage about 24 feet. The height of the drawing stage from the yard level is 10 feet 6 inches. Each setting of nine retorts is fitted with a self-contained hydraulic main, with an adjustable seal valve, which insures a liquor seal; the gas passing forward to the foul main. The condensible matter at once descends into a tar pipe; one connection being placed immediately at the back of each hydraulic main. The gas, after leaving the foul main, passes through a 7-fold coil of 22-inch pipes, arranged within the haunch of the circular girder roof; the pipes having an inclination in the direction of the retort bench, so that all condensable matters settling in these mains flow in the reverse direction to the stream of gas.

The division walls between the settings are 12 feet centers and 2 feet thick, with panels formed therein. By doing this, a larger space is secured for the circulating flues; and at the same time the substance of the 2-foot circulating division wall is maintained. The form of producer will be seen on reference to Diagram No. 1. The design is such as to insure the removal of the fuel gas from a point below the average surface of the fuel bed, thus securing a seal for the exit port; so that any air finding access through the producer charging door, as well as tarry coke vapor, must first pass through the fuel bed and become converted into gas. This insures a uniform quality of fuel gas going forward to the setting, and also avoids local combustion in the producer itself. The producer base at the fire bar level measures 3 feet by 4 feet 3 inches long. The gas is conducted to the setting by two distinct channels—one for the lower and one for the upper half; each conduit being governed by a damper so as to regulate the flow of gas to either half of the setting. The gas ports discharge at a point level with the inside of the bottom retorts, and are spaced so as to discharge between the division walls of the setting; the air ports being arranged to discharge under the opening in the division wall. The sides of the retorts in this portion of the chamber are shielded with silica tiles, the width of the combustion chamber being 10 inches; the co-mingling of the gas and air really taking place on a line a little above the center of the bottom retorts, and rising into the larger area over the sloping sides. The discharge of the secondary air immediately underneath the division wall also tends to protect this portion of the setting from the cutting action of the flame.

The settings are constructed of specially formed blocks up to the point approximately level with the crown of the two lower rows of retorts. Above this position bricks are used. Above the top line of retorts a complete covering of tiles is laid, in order to preserve a uniform area in the heat channels throughout the settings, and thus prevent the loss of draught by the gas having free play in the large area above the retorts and beneath the crown of the arch in the setting.

Special attention should perhaps be called to the design of the regenerative chambers; the author believing that these possess some degree of novelty. The primary factor kept in view has been to accomplish the heating of the secondary air with a minimum of resistance to its inflow to the combustion chamber of the setting. Bearing in mind the fact that settings of this class are worked at little more than level gauge, it is useless to expect that incoming air can be drawn through circuitous passages to the combustion chamber when there is no section in the setting to induce its flow; the only force available being its natural inflation on rarefication on its becoming heated by contact with the walls dividing this chamber from the waste gas passages on either side.

A special form of block was therefore determined upon, which could be made by machinery, having the thinnest possible substance between the waste heat chamber and incoming air, and yet of sufficient substance to withstand the thrusts and strains put upon it. This is clearly illustrated by the diagram; the thickness of the fireclay material between the waste flues and the air chamber being 1½ inches, and the transverse partitions being from ¾ to 1 inch in thickness. From careful observation and experience, it is found that the expansion and contraction of the work in use cause the transverse ribs of these special blocks to crack in preference to the thicker size; and thus the purpose of the ribs is still efficiently maintained. In other words, the block is so designed that the weaker portions should break first when subjected to undue strain; and when this weaker part is broken, it merely permits fresh air passing through the fracture into the air passages, while the dividing partitions between the waste gas and air remain intact. The waste heat chambers like-

wise offer a minimum of resistance to the flow of the waste gases to the main flues. The regenerative blocks are formed with a flange, upon which common bricks are placed to stay the regenerative chambers and to act as struts to withstand the thrust from the producer walls. They also act as conductors and reservoirs for the heat.

The general construction of the regenerator is clearly defined upon the perspective elevation shown on the diagram. There is nothing experimental about this furnace, nor the setting now in course of construction at Granton; two furnaces and settings have been erected at the New street works and operated for some considerable time now.

From Oct. 29 last to March 31 of the present year, the fuel account for this furnace averaged 13.35 pounds of coke per 100 pounds of coal carbonized; the lowest week's record being 12.12 pounds, and the highest 14 pounds.

The average weight of the charge of coal per retort was 7 cwt. 9 pounds; the heaviest week's average, 7 cwt. 1 qr. 27 pounds; and the lightest, 6 cwt. 3 qrs. 4 pounds. The coal used during this period was mostly of a slightly caking character; but it also included proportions of cannel and shale and highly caking coals and nuts. The duration of the charge is 4 hours, so that each retort carbonized 42 cwt. per 24 hours.

The front of the producer projects beyond the retort bench, to permit of the charging door being placed in such a position as to make the feeding of the producer as nearly automatic as possible. This projecting front is stayed by means of two 6-inch by 6-inch by ½-inch angle-irons sloping outwards, and attached at the upper ends to the stage-joists; the lower ends being embedded in the concrete. The clinkering door with frame is attached to these angle irons, and has a clear opening of 5 feet 5 inches by 2 feet 2 inches. Above the clinkering door, and upon the sloping portions of the angle irons, a ½-inch plate is riveted, within which the producer brickwork is built.

The producer has a grate bar area of 12 feet. The width over all on the face of the projecting portion of the producer is 5 feet 6 inches. This arrangement makes a very neat producer front, as well as a very strong one; it also forms a capital strut for the regenerative chamber on either side.

The importance of properly bracing the fronts of an inclined retort setting is fully appreciated by all, and may be said to be incapable of being overdone. The wisdom or necessity of bracing the upper front of the setting on the charging end in an equally efficient manner may be justly questioned. It is useless to attempt to prevent the linear expansion of the retorts. Our object should be to restrain and direct this inevitable lengthening into lines where its effect will be of no disadvantage. In the Granton settings, therefore, the author has abandoned all cross bracing on the upper face of the settings.

Destruction of Gas Pipes by Means of Electricity.

[A paper read by Dr. W. Leybold, of Hamburg, before Section VIII., International Engineering Congress, Glasgow, Sept., 1901.]

As is well known, for the distribution of gas in towns it is usual to lay long lengths of iron pipes, the larger of cast, and the smaller of wrought iron, The durability of these pipes varies from 25 to 50 years; those of cast iron lasting longer than those of wrought. In a few cases a quicker destruction takes place; for instance, when the pipes are embedded in cinders or ashes. Pipes are also soon corroded in gas works, where they are frequently laid in spent gas lime or spent oxide of iron; the constant formation of sulphate of iron as well as sulphuric acid most certainly producing a dissolving effect. Formerly it was customary in small gas works to allow the gas liquor to run into the ground, and this also caused corrosion. The pipes were formerly, and are now, principally coated with hot tar before being laid in the ground. Lately, several works, including those at Hamburg, have commenced to cover all wrought iron pipes with canvas and boiled tar, in order to protect them from outside destructive influences.

In recent years, a new and previously unthought of enemy of our gas pipes has showed itself—viz., electrolysis. Electric tram lines have been constructed, and through these a strong electric current is carried both above and below the surface of the ground. In most cases, at least so far as Germany is concerned, the construction of these tram lines is so arranged that an electric current from one or more stations of about 500 volts passes into the wires lying above the surface leading to the trams, and after running into the motor lying below the trams, returns, by means of the rails, to the engines at the electricity works. In order to cause the easier return transmission, the single rails are jointed at the points they meet by thick copper wires soldered to them. As the rails give a certain resistance to the current used, it is evident that part of the current on a favorable opportunity—*i. e.*, at a short distance—will pass through the earth into the gas and water pipes.

This happens in such a way that the current from the places far distant from the electricity works goes from the rails into the pipes, whereas near the same works, the current which has gone into the earth returns to the rails, and the part remaining in the rails returns to the engines, giving the current by the return transmission wire. As the pipes yield a less resistance to the current than the earth, a larger proportion of the current passes through the pipes than into the earth itself. The current flows from the rails into the pipes in the districts further away from the electricity works, and in the vicinity of the works again flows from the pipes into the rails; the pipes in this case proving to be the positive pole. The difference of tension between the pipe and the rail in various districts can be easily ascertained. It was advisable to determine whether, in pipes in the vicinity of which there were no electric trams, an electric current was in existence.

Dr. Bunte sent his assistant, Herr Lubberger, to investigate such a water pipe on the tableland Plinz, near Karlsruhe. This tableland lies 140 meters higher than Karlsruhe; and is 6 kilometers distant from the nearest electric station at Durlach. The system of water pipes is certainly not influenced from the outside; and yet considerable tensions were found. Also, during the time when the electric trams were not running at night at Karlsruhe, tension was observed in the gas pipes. Electric current flows in the pipes, and that pretty constantly.

The existence of the current at points which could not possibly be influenced by the electric current, can only be traced to the fact that the pipes are made of cast and wrought iron, and that lead is used as a jointing material, which metals, lying under damp ground, produce a galvanic action. When early in the morning the traffic of the trams commences at Karlsruhe on one line only, it sends the tensions through the whole length of pipes to the most distant parts. When the tram line is in full working, there is everywhere a tension difference. In Hamburg this amounts to scarcely anything in some places, but generally about 0.2 to 1 volt, and near the electricity works even as much as 4.65 volts. It must be borne in mind that at that time the Hamburg trams were only supplied from one electric works in the Carolinen street, so that the current in the rails must always return there. It may be seen from the yearly report for 1900, that the electric working line was about 100 km. long, and that about 400 cars were in use. The annual consumption of current amounted to 13 million kilowatt hours.

The gas works own a line of main pipes of 526 km. in length and 50 to 1,100 mm. diameter, with 443 km. of service pipes for houses. The experiments were extended over the whole town; and, as already stated, some tension was found at almost every point.

Now it is known that by the electric current, in the presence of saline solutions of different kinds, metals can easily be dissolved. Chloride of sodium is completely split up; and this is easily seen when 2 iron plates are placed in a solution of chloride of sodium, and a current allowed to pass through them. In the negative pole, a development of hydrogen at once takes place; while the fluid rapidly becomes thick through the separation of green protoxide of iron. Chloride of sodium is split up by the electric current into chlorine and sodium, which latter forms with water sodium hydroxide and hydrogen. The chlorine runs to the positive pole, and forms there protochloride of iron. This is precipitated by the sodium hydroxide as mentioned, as protoxide of iron. The process thus goes on until the positive pole is completely dissolved.

The process is easily shown if a current of electricity is passed through a thick glass pipe, closed at both ends by sheet iron plates and filled with sand soaked in a solution of chloride of sodium. The sand at the positive pole becomes of a green color as it sucks up the protoxide of iron which is formed. By degrees a yellow rust is produced through the admission of air. The same effect is caused by a solution of chloride of ammonia, gypsum, carbonate of lime, in such organic salts as are always found in the earth, and also of a watery solution of earth.

The ground in Hamburg contains small quantities of chloride of sodium to the extent of 0.006 to 0.04 per cent. It is also known that the electric tramway authorities in winter time melt up the snow and ice on the rails with raw salt or refuse of refined nitrate of soda. Soft ground is saturated with the solution; whereas from asphalt or granite pavement it flows off to the sewers. Accordingly, an opportunity is afforded for the eating up of iron in the earth in the presence of a solution of salt and an electric current. American newspapers have from time to time mentioned this matter; but in Germany nothing of the kind was noticed until a few years ago. In Hamburg, the first electric tramway (called the circular tram) was constructed in 1891;

and gradually all tramways were converted into electric trams—the whole work being completed by about the end of 1899.

In April, 1899, close to the electricity works in the Carolinen street, an escape of gas was found. On one side of the street is the main gas pipe of cast iron. Wrought iron service pipes cross the road to the lamps on the other side. In the middle of the road there are 2 lines of tramway rails—cars passing at intervals of 3 minutes; so that about every 1½ minutes a tram passes any particular spot. The rails are placed upon a bed of concrete 0.2 metre thick. The gas pipes are laid at right angles to the rails, at a depth of from 0.55 to 1 m. The street is paved with granite sets jointed with asphalt. Upon investigating the cause of the gas escape, a hole was found in a wrought iron pipe under the first rail; and after further investigating the matter, a complete penetration was discovered under every rail. The pipe was taken out of the ground, and the 4 holes coincided exactly with the positions of the rails. Upon closer examination, it was found that nearly all the pipes in this street were damaged in a similar way.

Owing to the holes fitting in exactly with the positions of the rails, it was clear that an electric influence was the cause. A melting of the pipes, as was often found in the case of the transmission of a strong current into gas pipes in houses, had evidently not taken place.

These 1-inch pipes are covered with canvas soaked in boiled tar. The investigation in the laboratory gave the following result: In some places the tar as well as the canvas had fallen off, and the pipes were eaten through in parts to the size of a centimeter. In removing the covering, it was found that the corrosion existed in every stage from the beginning until the complete penetration. Curiously enough, the destruction was principally of spiral formation, and coincided with the wrapping of the canvas, where between the strips of the canvas a portion of tar had been pressed out.

In many places there were blisters between the iron and the tar, which were filled up with a green solution of protochloride of iron; in some places also with crystals of the same salt. From such a blister 0.032 grain of crystalized protochloride of iron was taken out, the fluid (about 1 cubic centimeter) contained 0.0604 grain of protochloride of iron, 0.0086 grain of chloride of sodium, 0.0095 grain of chloride of ammonia, and 0.0037 grain of free hydrochloric acid. The solution was very sour, and a strong destruction of the iron was visible.

At other places there were also found blisters concealed by the layers of tar, which were filled with a green, slimy mass of protoxide of iron, of which it contained about 0.2 grain. Here also the decay was strongly visible. In other parts, the iron was completely eaten through, and covered with a thick layer of rust; the tar as well as the canvas at these places having become soft and brittle. The rust of the iron was very considerable, and contained acid, beside oxide of iron, about 9½ per cent. protochloride of iron, and chloride of iron; also 0.8 per cent. of sulphate af iron. Only 0.12 per cent. of chloride of sodium was found.

The collection of these chlorides of salts in one place is very strange. They were derived without doubt from common salt. Therefore, where a particle of a solution of salt can penetrate the tar covering the iron, the destruction commences, and, as previously stated, in one of two ways, either into protochloride of iron or protoxide of iron—apparently as the formed hydrate of sodium gets to the spot in question, and replaces the dissolved iron, or not.

Examined samples of the earth taken from the vicinity of the pipes consisted of clayish sand containing 0.006 to 0.04 per cent. of chloride of sodium, and in other parts 0.007 and 0.012 per cent. Apparently the wrapping with boiled tar and canvas favors the destruction, for in the blisters under the tar it quietly goes on; while with a direct bedding of the pipes into the earth without any covering, the earth would have absorbed the fluid.

All the gas pipes in the Carolinen street were taken up and replaced by others all covered; but after the expiration of seven to eight months, the destruction showed itself to have taken place again in the same manner as before—the pipes being penetrated with holes.

New trials were then made with pipes simply covered and tarred, also with untarred pipes, and others protected by being placed inside a second one. After two years—during which time the electricity works had taken some measures to prevent damage—the covered pipes showed signs of destruction, also the outer pipe; while the one inside it remained intact. The plain tarred, and also the untarred pipes, were fairly well preserved though heavily covered with rust; but it could not be decided whether to a greater extent than in other streets. In exposing same to the air, the rust covering of about 2 mm. fell off. Besides this, the pipes were covered all round with a firm layer of sand.

The quantity of common salt and soluble salts of iron in the rust was in this case very small. One pipe covered partly with 5 mm. of copper wire was laid down. The same after two years had turned into a green mass, consisting of carbonate of copper and hydrate of copper, besides chloride of copper, and 0.7 per cent. of chloride of sodium. It appears doubtful whether the packing protects the pipes; but, anyhow, at every bending of the covered pipes, the covering was destroyed by the falling off of the tar. Meanwhile, other pipes of different kinds, covered and uncovered, were placed in particularly dangerous spots.

Every endeavor must be made to reduce the currents passing into the pipes; and when laying down electric tramways, great care must be taken to prevent the current flowing into the earth. This can be done in one way by the laying of well conducted rails; the rails having sufficient transverse section, and the points of contact well joined together by soldered copper wire. The welding of the points of contact (according to the system of Dr. Goldschmidt, of Essen), by means of thermite, will probably be of great service. A further method—and this should certainly be done in Hamburg—is by fixing insulated return transmission cables in many places, in order to direct the current back from the rails to the electricity works, and thus to disburden the rails. These cables should be distributed in such a manner that the tension in the rails becomes sufficiently small. Only where small tramways come into consideration can such cables be dispensed with.

With the quick development of the electric tram traffic in Hamburg, the engines were in the beginning connected with the rails in the vicinity of the works by plain copper wires; and it was remarked that, even under these wires, the gas pipes showed signs of decay. Formerly the current for the trams was supplied from one works only. During last year a second one was opened at Barmbeck; and shortly a third one at Hammerbrook will be opened, in order to assist the others. The supply will then be divided among the three works. The tensions at each place will, therefore, be lessened.

The electricity authorities were persuaded to place a large number of insulated return transmissions similar to the feeding cables of the trams; and in consequence of this measure, the destruction of gas pipes caused by the current escaping from the rails can in future be left out of the question. While formerly in the Carolinen street tensions between rails and gas pipes occurred up to 5 volts, these have now been lessened to 0.45 volt maximum. Also in the whole system of the town, a pretty uniform and very small tension is observable, which in some cases is nought. and even has a tendency on the other side.

The whole affair has cost a great of money to the electricity works; but the measures taken proved to be necessary in order to avoid the threatened danger to all the gas and water pipes. It has to be remarked that in cast iron pipes no such destruction has so far been perceptible—the pipes of the water works, which generally are lying deeper than those of the gas works, showed no signs of decay, with the exception of some lead pipes in the vicinity of the rails.

Not long since, at Erfurt, similar damages appeared. Upon the commencement of the running of the electric trams, the old rails of the tramway were kept in use. They were not suitable, however, for the heavy electric tram; the consequence was that the connection of the rails became bad, owing to the proportionately heavy bending at the points where the rails meet each other. They gradually became looser and looser; and this, in conjunction with the very small transverse section, caused great electrical resistance in the current. This circumstance is no doubt the cause which led to the finding of the electrical destruction of the pipes at Erfurt.

Recently the German Electrical Technical Association has been busy with the drawing up of directions for the protection of gas and water pipes; and they prepared a statement of precautions, of which particulars will shortly be published. In the report, the requisite directions will be given for construction and arrangements; so that the escaping currents may be reduced to a minimum. At any rate, gas and water works can demand that the electricity authorities shall do everything in their power to protect their pipes. It may be remarked that electric currents in dwelling houses are suspected of having caused destruction to imbedded pipes within the walls, whereby the electric wires must have a connection with the earth. Such an example has been recently found.

It is well known that among different metals currents circulate in a solution of salt, as, for example, in a gas meter, the drum of which consists of Britannia metal, and the outer casing of lead covered iron plate; whereas the filling is chiefly salty glycerine, chloride of lime, chloride of magnesia, or water. The water of Hamburg is filtered water from the river Elbe; one liter containing 0.25 grain of salt. Even this is sufficient to produce a current. This may be to a certain extent the cause of the gas meter drums being destroyed. A slight current also

circulates in the station governor of a gas works between the outside tank and the governor bell; the tank consisting of cast iron, and the bell commonly of tin plated iron sheets. Sometimes in this apparatus signs of destruction are found, principally on the bell and on the closed air vessel.

It is hoped that the author has shown in the paper that the electric currents are of great importance to gas companies, and that they are worth serious observation, with a view to the protection of their property.

Results of a Year's Working of the New Gas Works at Zurich, Switzerland.

[Prepared for the JOURNAL by MR. WALTER S. ALLEN, New Bedford, Mass.]

All those who went to Europe last year came home with glowing accounts of the new municipal works at Zurich, Switzerland, and Mr. F. H. Shelton gave voice to these feelings in his paper read before the last meeting of the New England Association of Gas Engineers.

It is, therefore, interesting to see the results obtained in the first year's workings of the new plant, and the following figures are taken from the annual report for the year 1900—all figures have been recalculated from metric measures to English measures.

During the year Stack No. I. was run the whole time, Stack No. II. a portion of the time, being thrown out from time to time to use Stacks III. and IV. This was done to test the Brouwer coke conveyor, and the results were so good that it has been decided to put in the same machinery for Stacks I. and II.

The advantages which have been obtained by the mechanical handling of material are best shown by the results secured per mouthpiece per day. The production, which in 1897 was 7,723 cubic feet per mouthpiece, rose, in 1900, to 9,885, and this increase in production was accompanied by a decrease in the amount of coke used in the generators and a decrease in the charge for labor.

The following table shows the results of the last two years:

	Gas Made. Cu. Ft.	Working Shifts.	Gas per Shift. Cu. Ft.	Retort Days.	Gas per Retort Day, Cu. Ft.
1900	465,443,700	11,997	38,797	47,086	9,885
1899	423,142,900	12,775	35,043	48,955	9,038

This output of nearly 39,000 cubic feet per shift compares with an output of 20,200 from the old works in 1897, and this in spite of the fact that during the year the quality of the coal was not of the best. As compared with the previous year the cost of materials (coal and enrichers) increased 4.8 cents per 1,000 cubic feet, but labor decreased from 7.1 to 4.8 per 1,000.

The material used was 47,166 tons of coal, 330 tons boghead and 103 tons benzol (equal to about 28,000 gallons).

The production per ton of materials gasified was 9,780 cubic feet of gas, 1,461 pounds coke, 124 pounds tar, and 16 pounds sulphate of ammonia.

Coke used in the generators was 220 pounds per ton of coal carbonized, as against 279 pounds in the previous year. It was found possible to keep up the heats by clinkering only once in 48 hours, the grates being cleaned every 2 hours, and for this reason there was a saving of labor.

The distribution of the gas sold was as follows: Total sales, 443,252,700 cubic feet, an increase of 11.76 per cent. over the previous year; gas for public lighting, 79,236,300 cubic feet; for private lighting, 135,765,600 cubic feet; for cooking and heating, by separate meters, 163,150,200 cubic feet; for gas engines, 25,091,600 cubic feet; to the Northeastern Railway, 21,509,100 cubic feet; to the public buildings, 17,483,100 cubic feet; for balloon, 190,700 cubic feet; supplied outside the city limits, 826,100 cubic feet; used at works and offices, 3,745,500 cubic feet; unaccounted for, 17,580,100 cubic feet, equal to 3.83 per cent.

The gas used for cooking and heating increased 20.67 per cent. during the year, and exceeds that used for private lighting by over 27,000,000 cubic feet. The number of engines supplied was 186, with 1,227-horse power.

The number of public lamps was 6,625, of which 3,596 were incandescent. These last used an average of 3.7 mantles and 2 chimneys per year. The minimum candle power of the gas supplied was 11.4, the maximum 17.1 with an average of 13.7; but these were tests made by the city—the tests at the works averaging rather more than 1 candle higher. The number of meters in use, December 31, 1892, was 3,714; on December 31 of 1898, 16,137; and on December 31, 1900, 19,689. These meters were divided as follows:

	1892. Per Cent.	1898. Per Cent.	1900. Per Cent.
For lighting gas	87.7	50.8	45.5
" technical gas	2.8	1.1	0.9
" motor gas	0.6	1.2	0.9
" cooking and heating gas	8.9	46.9	52.7

The price charged for lighting gas is $1.42 per 1,000; for cooking, etc., 96 cents per 1,000; but 2 burners for light are allowed on every meter for cooking and heating gas—and 3 more lights may be attached by payment of a small fixed sum amounting to about $1 per burner per year.

These figures seem to prove the statements made by the visiting engineers that these are model works, and the distribution figures are quite remarkable in showing such a large use of gas for purposes other than light in a city of 150,000 inhabitants.

Development of the Nernst Lamp in America.

[A paper read by MR. ALEXANDER JAY WURTS, at the Buffalo Convention of the Am. Inst. Electrical Engineers.]

Explanatory Notes.—The Hefner unit of candle power has been adopted in this paper so that ready comparisons may be made with the results obtained on the Nernst lamp in European countries.

Names of parts in the Nernst lamp: The "glower" is the filament or light giving body. The "ballast" is a steadying resistance connected in series with each glower. The "holder" is the removable piece containing glowers and heaters. The "heater porcelain" is the porcelain disk in the holder immediately back of the heater. The "heater case" is a small glass globe used in the 6-glower and 30-glower lamps.

It was in 1897 that Mr. Henry Noel Potter, while in the employ of Mr. Westinghouse, at Goettingen, became acquainted with the Nernst lamp. Early in 1898, Dr. Nernst, Mr. Potter and an assistant came to East Pittsburg at Mr. Westinghouse's request and exhibited the new discovery. Mr. Westinghouse quickly recognized its great possibilities and directed the writer to prepare for its commercial introduction. A happy choice brought Mr. Marshall W. Hanks to my assistance. Mr. Potter returned to Goettingen to study some of the details of the work. In June, 1899, Mr. Edward Bennett joined us, as did also Mr. Frederick M. Goddard a month or two later, who had been assisting Mr. Potter in Germany, but unfortunately in December of that year, Mr. Goddard contracted a violent cold from which he never recovered. In February, 1900, Mr. Murray Charles Beebe joined us and in August of the same year, Dr. Max von Recklinghausen.

I have thus briefly introduced the characters who have worked upon the Nernst lamp in America and without whose names its history would be incomplete; my only regret being that these gentlemen are not all present on this occasion to share in the pleasure of announcing to the American Institute of Electrical Engineers the results of our work upon the Nernst lamp.

The Glower.—It is not my purpose to describe the details of our experiments, but rather to give the results of our work. Let us begin with the glower, so named to distinguish it from the filament of the incandescent lamp.

Our standard 220-volt glower is about 25 millimeters long and .63 of a millimeter in diameter. It is made by expressing from a die a dough made of the rare earths mixed with a suitable binding material, cutting the porcelain-like string thus made into convenient lengths, drying, roasting and finally attaching lead wires. This sounds very simple, but the making of glowers is an art not easily acquired; it is the result of long and painstaking investigation, particularly with reference to the terminal connection between the glower and lead wire. This connection, as Dr. Nernst made it, consisted of a few turns of platinum wire wound around each end of the glower, the convolutions being finally pasted with cement. This forms a successful and effective terminal, but the shrinkage of the glower ends, away from the convolutions of platinum wire sometimes causes the contact to deteriorate, resulting in the weakening and early destruction of the glower near the terminal. In the Hanks terminal these conditions are reversed. A platinum bead is embedded in the end of the glower in such a manner that any tendency to shrink on the part of the glower material can result only in tightening the contact and thereby maintaining intimate union between the platinum bead and the glower. It is then, a simple matter to fuse lead wires to the embedded platinum beads.

The glower, as you all know, is a non-conductor when cold, becoming, however, a conductor when heated. It is also an electrolyte; but it may be fairly stated that this phenomenon is not clearly, if at all, understood. Oxygen, however, seems to be necessary, or at least desirable, for it's successful operation. As might be expected, no electrolytic action is apparent when operating with alternate current. With direct current, the electrolytic action is quite marked, resulting in a black deposit on the negative end of the glower, which spreads gradually from the negative toward the positive terminal. As this deposit increases, the voltage of the glower changes somewhat, and the candle power and efficiency fall off, owing to the poor light emitting proper-

tion of the blackened portion. The life of the glower on alternating current is about 800 hours; with the same glower on direct current it is considerably less than this. There are, however, radical improvements being made in direct current glowers.

A glower burns at a higher efficiency in its own heat, that is, in a globe, than it does in the open air. We shall refer again to this feature in connection with the multiple glower lamp. The glower is as strong as a piece of porcelain of the same size, and it is difficult to break a short section. The terminals of a glower give off platinum black, which deposits on the globe; and although this cannot be wiped off with a cloth, it is easily removed in a variety of ways, so that the globe may be considered a permament fixture in the lamp, and, for that reason, may assume fancy designs. When properly made, the voltage of a glower changes but slightly during its life, the tendency being to rise from 2 to 4 per cent. in 800 hours. For a short time before rupture, the voltage rises rapidly until the glower is broken.

The characteristic of a glower with reference to voltage and current is remarkable, and has given rise to the necessity of a steadying resistance. As the current in the glower is increased, the voltage across its terminals rises, at first rapidly, and then more and more slowly to a maximum, beyond which it again drops off with increasing rapidity as the current and resulting temperature through the glower continue to increase. Beyond the point of maximum voltage, the decrease in resistance of the glower is so rapid as to make the current difficult of control. In fact, without a steadying resistance, such a conductor would rapidly develop a short circuit and flash out. The characteristic

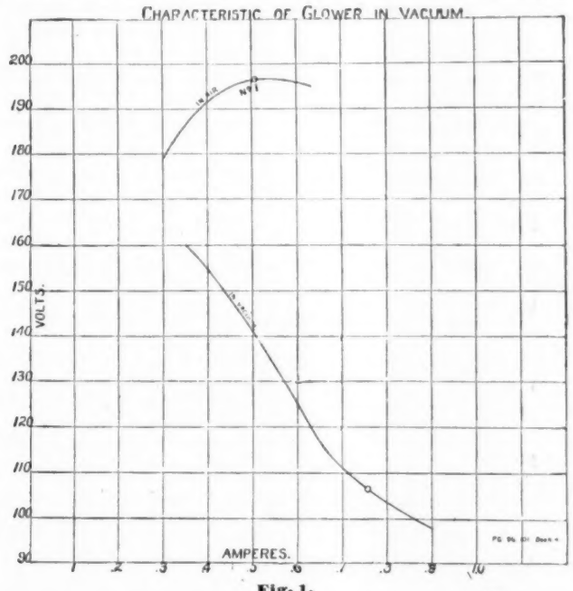

Fig. 1.

of a Nernst glower is shown in curve 1, Fig. 1, the small circle situated near the crest of the curve representing the point of 1.76 watts per candle in the open air.

In studying the characteristics of the glower and seeking for methods of operation under the best possible conditions, we naturally exploited the field in various gases including a vacuum, and although the experiments in this direction have not been exhaustive from a scientific standpoint, the results have been negative as far as practical results are concerned, and have demonstrated that for the present, at least, there is nothing to be gained in this direction. The vacuum curve and corresponding air curve are shown in Fig. 1. Aside from the fact that the vacuum has shifted the point of 1.76 watts efficiency to a much lower voltage and higher current density, it will be observed that all the points of the curve now lie on one side, giving a decreasing difference of potential for an increasing current. Such a condition as this involves the use of a relatively large steadying resistance, and renders the operation of the glower inefficient. Fig. 2 shows the nitrogen curve with corresponding air curve, and it will be observed, as in the case of the vacuum, that this gas has also rendered necessary a large steadying resistance and has thereby lowered the available efficiency of the

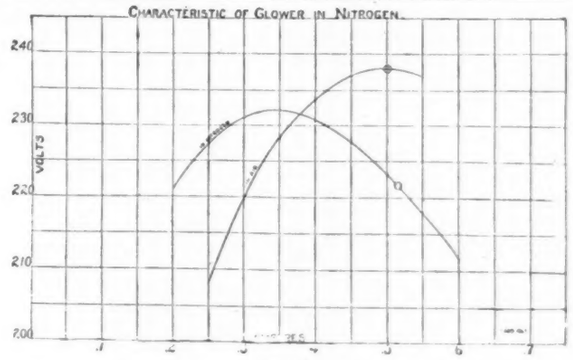

Fig. 2.

glower. In Fig. 3, we have both the oxygen and hydrogen curves to compare with the air curve. It is interesting to note how closely the oxygen and air curves compare with each other, while the hydrogen curve shows characteristics similar to that of the vacuum curve requiring a large steadying resistance.

There is an interesting phenomenon connected with glowers operating in a space free from oxygen, and which seems to be especially pronounced when operating in a vacuum. Where oxygen is excluded, the glower seems to be sluggish and to respond but slowly to changes in line voltage. The curves in Fig. 4 show this sluggish action in a vacuum. The line voltage is indicated by a dotted line in the upper part of the diagram, beginning with 270 volts. The upper solid curve shows the change of current value during a lapse of time indicated in minutes; while the lower curve shows the change in voltage on the glower during the same interval. Previous to this test, the glower had been run at .25 of an ampere for half an hour, after which the line voltage was raised 20 volts and the current values and differences of potential on the glower were taken at intervals for 10 minutes, resulting in the curves shown. Shortly after the completion of this test, the line voltage was lowered 20 volts, when the glower again adjusted itself slowly to the new conditions, and returned to its original current and difference of potential. In air, the glower would have responded almost immediately to similar changes in line voltage. It is likely that the slight changes in both cases after the first minute are largely, if not entirely, due to the temperature correction of the resistance that was connected in series with the glower.

Steadying Resistance or Ballast.—The advantage to be gained by the use of a steadying resistance which would enable the glower to be operated efficiently at a point on or beyond the crest in the characteristic curve, was well recognized. To accomplish this under all conditions of commercial use, and with as little loss as possible under normal conditions, the steadying resistance should have as large a positive temperature correction as possible and this temperature correction should always be immediately available. For example, if the glower were operated on or beyond the crest of the characteristic, the current

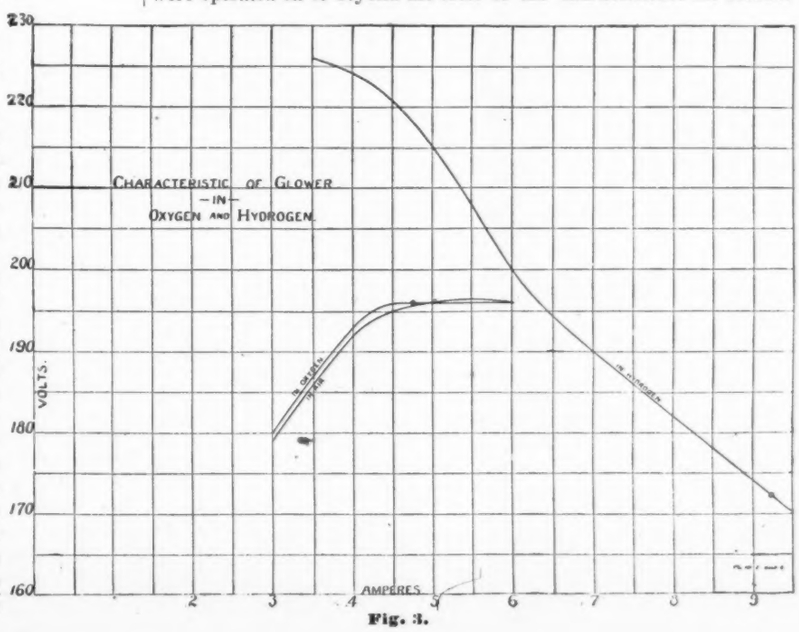

Fig. 3.

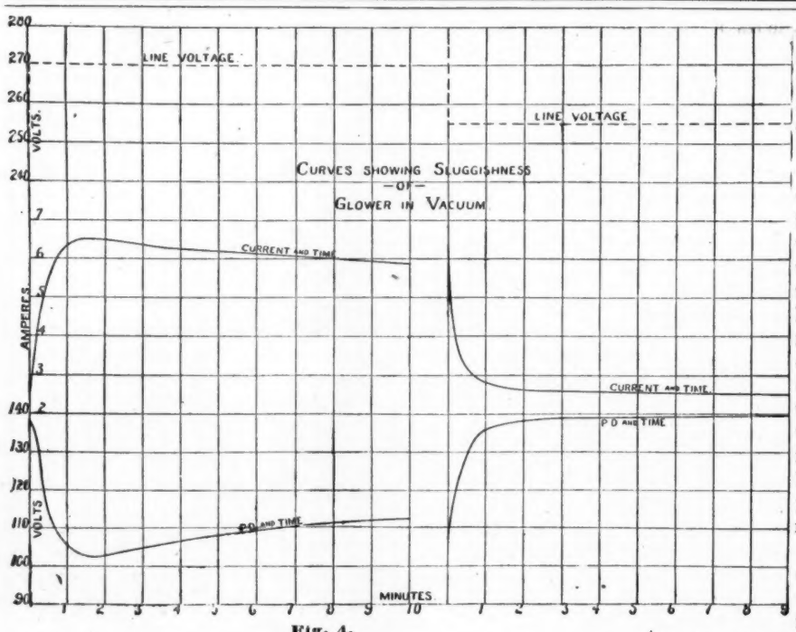

Fig. 4.

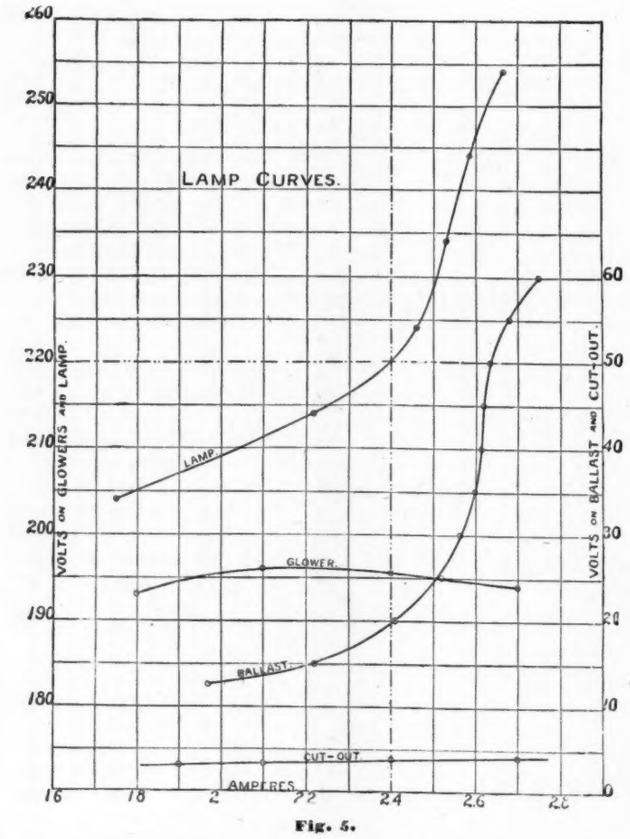

Fig. 5.

could obviously be controlled by a sufficiently large steadying resistance having no temperature correction, but such resistance would very materially decrease the net efficiency of the glower. On the other hand, if the resistance is assumed to have a high temperature correction, the necessary steadying resistance under normal conditions may be very much less than when no temperature correction is present, and then should there be an increase in electromotive force above normal, the corrective power of the steadying resistance would be brought into play to check any abnormal flow of current through the glower; in other words, to take up the additional voltage; but, as already stated, the temperature correction should be immediately available, for if it were not, the glower would "shoot over" when lighting above the normal pressure, that is, take more current at the start than it would a little later after the temperature correction of the steadying resistance had asserted itself. The same would also be the case with any sudden increase in the electromotive force applied to the glower, unless the corrective power of the steadying resistance were immediately available to check the current flow.

Mr. Potter has designed a steadying resistance or "ballast," as he has named it, which is certainly unique in construction and which meets in a very effective manner the peculiar requirements of the glower. Iron wire is used on account of its high temperature correction, and by properly mounting this in a small glass tube filled with some inert gas, he has secured a ballast having at once a high corrective power with minimum resistance at normal, and oxygen being entirely excluded, the wire can readily be worked throughout the entire high corrective region without danger of destruction. This remarkable characteristic of the ballast is well shown in Fig. 5, from which it will be noticed that for a 10 per cent. rise in current the resistance of the ballast increases 150 per cent., so that a glower thus protected becomes at once operative throughout a wide range.

The Heater.—As already stated, the glower is a non-conductor when cold, becoming, however, a conductor when heated. For practical service in a lamp, therefore, it is necessary that some means be provided for heating the glower and bringing it to a conducting temperature. This topic could well form a subject by itself, but time will permit me to review but briefly the developments made in this direction. Some of the lamps which Dr. Nernst brought with him from Europe were fitted with electric heaters, while others were intended to be heated by an alcohol lamp or even a match. The further refinements of the lamp imposed new and severe requirements upon the heater. It is therefore especially gratifying that we can announce the construction of a simple, satisfactory and effective heater, suited to the requirements of the latest forms of the lamp. The glower is lighted at a temperature of about 950° C., and it will be apparent to all that to acquire such a temperature quickly and without rapid destruction of the heater and adjacent parts, seriously involves the question of materials. Platinum for the heater seems like an undesirable expense in a commercial lamp, and although many attempts have been made to devise a cheap mineral heater, platinum still holds its own as the least expensive, the most durable, and altogether the most desirable material for this purpose; and, after all, the expense is not so serious, because when the platinum heater is burned out, the value of the scrap is nearly 90 per cent. of the original cost, and as the labor is almost negligible, the running cost of the heater is quite small.

As now constructed, the heater consists of a thin porcelain tube overwound with a fine platinum wire pasted with cement, the latter serving as a protection to the platinum wire from the intense heat of the glowers. These tubes are wound for 110 volts and are connected in pairs of two in series according to the service, the one, two, and 3-glower lamps taking one pair, and the 6-glower two pairs. These heater tubes are mounted on a porcelain support in such a manner as to afford easy access for repairs without removing the glowers. The life of the heater when running continuously is about 200 hours, or 133 hours when the current is turned on and off 4,000 times at regular intervals. Inasmuch as the heater is not called into service for more than about 30 seconds to light the glowers, this would indicate a practically infinite life. In actual service, however, the heater remains in close proximity to the glowers and the high temperature to which it is thereby subjected causes a material decrease in its life. Nevertheless, the life of the heater is surprisingly long, probably several thousand lamp hours. The exact time, however, cannot be definitely determined until a large number of lamps have been operated over a very considerable period in general commercial lighting.

[To be Continued.]

Water Gas Tar as a Boiler Fuel.[1]

"How can we best dispose of water gas tar?" is a question that must have occurred to many gas managers in recent years. A representative of the *Gas World* had an opportunity lately of inspecting one method of utilizing it. The tar came from the works of the Crystal Palace District Gas Company (London), and was a genuine specimen of carburetted water gas tar, with the usual proportion of water in it. This tar is being successfully used as a boiler fuel at the electrical engineering works of Messrs. Muirhead and Company, Elmer's End, Kent. At the time of our representative's visit the tar was being used in firing a Hornsby water tube boiler of 50-horse power, and also the steam boiler of a motor car. Tests have been made with one and the same boiler

1. *Gas World.*

with coke firing and with water gas tar firing, and the results, as furnished to our representative, are as follows:

	Coke.	Water Gas Tar.
Duration of test	9 hours.	2 hours.
Mean temperature of feed water	60° F.	70° F.
Mean pressure on boiler	90 lbs.	90 lbs.
Pounds of water evaporated	10,000	2,400
Pounds of coke (and tar) consumed	1,792	211
Pounds of water evaporated (from and at 212° F.) per pound of coke (and tar)	6.73	13.47

These tests show that 1 pound of water gas tar is equal to 2 pounds of coke as a boiler fuel, so that anyone can readily calculate the relative costs of the two fuels at the current prices of coke and tar. A correction should be made, however, in the case of the tar fuel, for between 7 and 8 per cent. of the steam made is required in the tar burner. This burner is of simple construction, but it is claimed for it that, in conjunction with a special combustion chamber, it gives results not hitherto obtained in liquid fuel practice. The burner is of the injector type, with the oil nozzle in the center and slightly in advance of the annular steam outlet. The steam jet thus creates a vacuum, which sucks in the oil. The steam supply is taken from the boiler, and used at a pressure of about 50 pounds, and the oil is at atmospheric pressure; the burners taking their supply from a small reservoir placed at a slightly lower level than the burners, so that no oil can flow into the furnace when the burners are not in action. The outflow of oil relatively to the volume of steam is regulated by a needle valve operating at the point of outlet. The intimate mixture of vapor issuing from the burner is directed to a dash brick; but it is essential, in order to produce complete combustion, that the dash brick should be of a certain size, and located in a certain position. and that between the burner nozzle and the dash brick there should be an enveloping constricted way or passage of refractory material, the area of which bears a certain proportion to the size of the burner employed. By these means every particle of vapor is kept together until it fires on the dash brick, which, owing to the concentration of the vapors at that point and its comparatively small area, rapidly becomes sufficiently heated to split up the vapor into its component gases, which, after leaving the brick, reunite and give out heat in the main combustion chamber.

With the boiler seen at Messrs. Muirhead & Co.'s works three burners are employed, each acting in its own combustion chamber; and it is to this limitation of the primary combustion chamber that the patentees of the system attribute a large part of their success. Instead of spreading out the oil jet, and thus running the risk of cooling and incomplete combustion, the jet is concentrated, and the combustion rendered complete and certain.

The system was also seen applied to a motor car fitted with a special tubular boiler known as the "Hydroleum," and an evaporative test with this boiler gave 15.01 pounds of water per pound of tar; and a traction test over a distance of 8 miles showed a consumption of 2.31 pounds of tar per mile, the weight of the loaded car being about 2½ tons. The system, which is owned by the Hydroleum Company, Limited, 323 High Holborn, London, can be applied to any class of boiler, and our representative was informed that a boiler fitted with it can be reconverted for solid fuel in the space of half an hour, so that it would be possible to use either solid or liquid fuel as the state of the markets might render desirable.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, Sept. 10th, 1901.

A Projected International Gas Exhibition.—Mr. H. E. Jones on Modern Gas Practice.—Gas Engineers in Conference at Glasgow.—Is Cheap Gas Everything?

Arrangements are in progress for holding an international gas exhibition at the Crystal Palace near London, to be opened on December 14, and to extend over about one month. The project has been initiated by Mr. T. G. S. Kersey, who organized a similar display in London two years ago, and the head office is at 49 Victoria street, London, S.W. A preliminary list of patrons has been issued, which includes a goodly representation of the gas profession, and there will be exhibits from the United Kingdom, the United States, Canada, the Continent, etc., divided under the following classes: (1) Gas lighting, ordinary and high pressure. (2) Light and heat. (3) Meters, ordinary and slot. (4) Testing apparatus. (5) Heating and cooking apparatus. (6) Gas plant. (7) Materials used in gas manufacture. (8) Gas engines. In connection with gas stoves it is proposed to have lectures and demonstrations. Prize competitions will be arranged and samples of plain, restaurant, hotel and high-class cookery will be on view, and medals, diplomas of merit, etc., will be awarded. The general exhibits will be arranged in 13 sections, and gold, silver or bronze medals will be awarded; also certificates of three degrees of merit. A committee including several well known gas engineers will act as judges.

It is scarcely necessary to say that the progress of invention in connection with all departments of gas consumption has been so marked during the last year or two that there should be no difficulty in providing a show sufficiently novel in character to attract visitors from a long distance. In connection with ordinary lighting, the public can be shown how to get 30-candle power per cubic foot of gas, and the number of technical appliances for special purposes increases every day. Several improvements have been made in gas engines, and although no mention is made of gas as an aid to ventilation in the above preliminary test, no doubt that subject will be well represented. There are several novel artistic designs in gas fittings available, sufficient to show that the use of gas is not inconsistent with the highest ideals of art. Altogether there is no reason why the proposed exhibition should not prove a complete success.

The movement is the more satisfactory on account of the languor that seems to prevail amongst our Gas Managers' Associations. Beyond holding meetings, these bodies do nothing for the advancement of the industry. Yet in the States and on the Continent the Gas Association movement appears to be much more active than it is here. The reason is not far to seek and lays in the fact that the British gas industry is undermanned. One hat as a rule will cover the engineering and managing talent engaged in even a fair sized works. What with inclined retorts, generator firing, stoking machinery, slot meters and fittings on hire, public and private maintenance of incandescent lights, and other questions of the day, the average active Association man has his hands full, and the experience at meetings is a short paper list and a very moderate attendance, members, who in former times set the whole thing through, being now perforce contented if they can support the President by listening to his address. Even the annual holiday is being cut down to a mere week end trip. When we look at the combined effort that is brought to bear upon matters of comparatively much less importance, we cannot but regret the absence of anything like united public action in the interests of the British gas industry, though nothing different can be expected so long as directors and shareholders maintain an attitude of studied indifference towards the Gas Association.

A paper entitled, "Modern Practice in the Manufacture and Distribution of Gas," was read before the Institution of Civil Engineers, in April last, by Mr. H. E. Jones, Engineer and Manager of the Commercial Gas Company, London. and one of the best authorities of the day on topics of this kind. The paper, together with the discussion originated by it, in which many of the leading gas engineers of the day took part, forms a useful record of the present position and of the principal items before the minds of those responsible for the conducting of this important branch of civil engineering, and some idea of the extent to which the subject was dealt with may be gathered from the fact that the printed report covers 78 large octavo pages. The author commenced by remarking that the close of the last century had been marked by three very important and far reaching innovations in respect to the consumption of gas, and these were the Welsbach burner, the coin meter, and sliding scale legislation. Commenting on the rapid growth of the industry he quoted from the official Parliamentary returns the fact that during the last 4 years the invested capital had increased 40 per cent., the income 21 per cent., the quantity of gas sold 24 per cent., the mileage of mains 12 per cent., the number of consumers 31 per cent., and the number of public lamps lighted by gas 10 per cent. He went on to deal with labor saving machinery, residuals, enrichment of gas, carburetted water gas, capital expenditure, and the cost of other details connected with the laying out of a modern sized gas works, concluding with the subject of distribution. In the course of the discussion Mr. A. G. Glasgow offered a few observations on the subject of water gas, and Mr. Geo. Livesey and Mr. Corbet Woodall made important statements. Mr. F. S. Cripps dealt at considerable length with the question of gasholder construction, while Mr. Chas. Hunt had something to say as the engineer of a large gas works owned by municipal authorities. Mr. W. R. Hutton made some reference to the condition of the gas industry in New York city. It is rather a pity that such an important deliverance was made before an Institution whose reports are not accessible to a large number of those particularly interested in the subject, and at the same time the fact that some of our best and most instructive papers on the subject of the gas industry have appeared before bodies such as the Institution of Civil Engineers, the

Chemical Society, or the Society of Chemical Industry, while Secretaries of Gas Managers' Associations are at their wit's end to get up sufficient pabulum for the periodical meetings, is worthy of note.

This last remark is supported by the success which attended the gas section of the International Engineering Congress, which took place at Glasgow last week in connection with the Exhibition held in that city this summer. Over 100 gentlemen, including prominent members of the profession, gathered together for a 3 days' session under the able chairmanship of Mr. Geo. Livesey, to hear an inaugural address from that gentleman and to discuss 10 papers. These were of a specially representative character and included a description of the lighting arrangements at the Exhibition; a paper by M. Fernand Bruyere, dealing with a design for utilizing the heat and steam given off by quenching coke from coal gas retorts, for the production of water gas; a contribution by Prof. Vivian B. Lewes on the utilization of water gas in the destructive distillation of coal; an account of a clockwork apparatus for turning on public lamps at predetermined times, by M. Rothenbach, of Berne; a paper, by Dr. Van Rossum du Chattel, on the principles of construction of a proposed new gasholder tank at Amsterdam; the production of illuminating gas was dealt with by Dr. F. Schniewind, of New York; the destruction of gas pipes by electrolysis was the topic selected by Dr. Leybold, of Hamburg; Mr. C. C. Carpenter introduced the subject of the application of the unit system of gas manufacture to its purification; Mr. W. R. Chester had something to say about the mechanical handling of solid materials or residuals in gas works; and Mr. W. R. Herring went deeply into the construction of inclined retort carbonizing plant.

The Glasgow Exhibition and the Engineering Congress were not the only attractions offered to visitors to Scotland, as the annual meeting of the Institution of Gas Engineers was held at Edinburgh in the same week. Mr. W. R. Herring, the President for this year, is the Engineer to the Edinburgh Gas Commissioners, who have had to deal with the problem of removing their gas works from populous neighborhoods to a more appropriate site. Mr. Herring has, therefore, enjoyed the opportunity of erecting a complete new works at a convenient locality well outside the residential area, and the prospect of a visit to these works is a great attraction. These points are mentioned here because they had the usual effect on the discussions of the papers above mentioned, which were scarcely adequate to the capacity of the company. For one thing the visit to Scotland was to some extent a pleasure trip, and many were accompanied by lady friends. And then Glasgow, even in ordinary everyday dress, affords many attractions for engineers. For good, solid discussion there is nothing like a London meeting, with no outside attractions, but when there are other things on hand, as when the place of meeting happens to be a celebrated pleasure resort, or offers inducements of more solid nature, the discussions tend to become brief and scrappy, and many members speak as if conscious of the fact that somebody was waiting outside for them, while the remarks of others betray that they have not heard the whole of the paper. In proof of this it is interesting to compare the discussions at the Bute Hall of the Glasgow University with that on Mr. Jones' paper in the theater of the Institute of Civil Engineers.

A year ago the position of the coal market forced gas companies to do what many had never done in all their experience before—to raise the price of gas. For many years the doctrine of cheap gas has been so constantly propounded that it is open to question whether the importance of this factor—admittedly by no means inconsiderable—has not been unduly magnified, to the detriment of other matters that should not be overlooked. While preaching cheapness, the consumer may be left to find out other advantages that are equally attractive. After twelve months' experience many undertakings are able to say that they have raised the price and are not "one penny the worse," and that the public do not object to increased prices provided fair reason can be adduced for the same. And the companies who are able to record this satisfactory showing are not so much those who have taken care in the first place to supply a good article, and in the second to teach the consumers how to use it—who not only let out stoves and fittings on hire or maintain incandescent burners, but take care to keep in touch and see that the same are in regular use. In many towns the gas people have, ostrich-like, protected their heads under the shield of "cheap gas," and at the same time allowed electricity to usurp the lighting of the principal streets. Go into one town and the sole representative of gas lighting in the shops is a few sickly looking incandescents with broken, dirty mantles and a general woe-begone appearance. Go into another and every other shop or more is a brilliant advertisement of modern gas lighting. The difference is that the company are indifferent to the lighting business in the first case, while they are not inclined to let it go over to the enemy without a tussle in the second. The probability is that the first undertaking reports that, "Owing to the unfortunate but unavoidable necessity for raising the price of gas, and the mild, bright weather of the past winter, the consumption of gas has fallen off." The second reports that "Sales are not only well maintained but show a satisfactory increase." Whether this explanation of matters is correct or not, the fact that in many cases the rise of 3d. to 6d. per 1,000 cubic feet has not had the slightest prejudicial effect as regards sales or anything else, is worthy of careful consideration. No doubt there are many people who use a thing because it is cheap, but they do not appreciate it any the more for having its cheapness continually thrust upon them. In fact, they like to feel themselves, and especially like their neighbors to feel, that they can afford to use high priced articles. Cheapness will advertise itself sufficiently, but there are several advantages that will not advertise themselves and which it is the business of the sellers to make known. For one thing, the fad for labor-saving has been carried to a ridiculous extent, and things that are "self-acting" will realize prices altogether out of proportion to their value. Gas can be made "self-acting" in a variety of ways. Teach the public the numerous utilities that follow on the use of gas, give them a supply that is unexceptionable in quantity and quality—good, honest stuff, with plenty of hydrogen and methane, and very little non-combustible diluent—something that will give light and heat, and does not require fortifying with enriching materials to enable it to make a brave show in the official testing room, and there will be no kicking about the price so long as it is kept within fair and reasonable lines. But if, through mismanagement or misfortune, the price is comparatively high, someone is sure to find it out and make a splutter.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

A "CANADIAN SUBSCRIBER," who writes to us from Toronto, Can., under date of the 23d inst., is informed that he will have to furnish his full name and address before we will reply to his questions. In a general way, however, we may and do say that his "doubts as to the practicability of using gas in the way mentioned" are well founded.

MR. A. C. AREND, C.E., has resigned from the service of the Pennsylvania Steel Company to engage in a position of responsibility with Messrs. Heyl & Patterson, of Pittsburg, Pa.

THE JOURNAL for the 16th inst. contained an item to the effect that Mr. H. D. Walbridge and others had applied for a franchise under which to operate a gas plant in Detroit, Mich. Mr. H. D. Walbridge, writing under date of the 19th inst., from Detroit, desires us to say that he is not in any way interested in the projected enterprise. In furthering this correction we report that the initials should have been W. D. instead of H. D. We understand that Mr. W. D. Walbridge is a resident of New York.

IT seems likely that the Ocean Grove (N. J.) Camp Meeting Association is about to listen to the voice of reason, through permitting the Consolidated Gas Company, of New Jersey, to pipe the Grove for the supply of gas thereto and therein. We have no doubt that such a service would enhance the renting value of the tents and other structures in the camp, without in any material sense curtailing the electrical outfit that is controlled by the Grove's owners. The matter was to have been formally considered last week, but we have not heard that a final decision was reached.

"S.," WRITING from Philadelphia under date of the 24th inst., incloses the following: "Final negotiations for the sale of the Wilmington (Del.) Coal Gas Company were completed yesterday, and the announcement was made that the properties had been sold to Messrs. John and James Dobson of this city, at the price heretofore named in the JOURNAL. The purchasers already own the Peoples Railway system in Wilmington, but whether the two concerns will be operated together is not known. It is understood that the properties will be bonded, for $1,000,000. The new owners take possession the 1st prox., and the Company will be completely reorganized. The Messrs. Dobson assert that the purchase is quite in the nature of a private investment."

AT a special meeting of the Fostoria (O.) City Council the franchise of the local gas suppliers was declared forfeited.

MR. HENRY L. DOHERTY has been deputed to complete the reorganization of the Lincoln (Neb.) Gas and Electric Company. Hard task though it be, the gentleman is fully equal to the handling of it.

THE following letter, to Mayor Blessing, of Albany, N. Y., was received by him last Tuesday, and it further affords a testimonial to the sturdy nerve of its composers:

"PITTSBURG, PA., Sept. 23, 1901.

"Mayor of Albany, Albany, N. Y.—Dear Sir: Kindly inform us what chance the writer and his associates would have of receiving a fuel gas ordinance to supply your citizens with manufactured fuel gas at a price not to exceed 50 cents per 1,000 cubic feet. If this meets with your favor, would be pleased to show you one of our plants in operation, and demonstrate that manufactured fuel gas with our system is being sold at about natural gas prices. Hoping to hear from you favorably, we are, yours very truly, W. J. MCCLURG GAS CONSTRUCTION CO."

AT an adjourned meeting of the City Council of Burlington, N. J., held the 23d inst., an ordinance was passed authorizing the projectors of the "Dollar Gas Company" to construct and operate a gas plant in the limits of Burlington township. Some of the conditions imposed are: That the selling rate shall not exceed $1 per 1,000 cubic feet; that a coal gas plant, of a capacity not less than 100,000 cubic feet per diem, shall be erected within 18 months from the signing of the ordinance; and that the illuminating value of the gas supplied shall not be less than 20 candles. Of the "Dollar Gas Company" it may be said that its paternity is likely in the South Jersey Gas, Electric and Traction Company. It is a pity that the executive management of the South Jersey Company did not buy the old Burlington Gas Company's properties when the latter could have been bought cheap.

THE executive management of the Welsbach Company, changes in which were obligatory through the death of Col. Barrows, has been thus constituted: President and General Manager, Sidney Mason; First Vice-President, Samuel T. Bodine; Second Vice-President, Randal Morgan; Third Vice-President, Walton Clark; Secretary and Treasurer, Lewis Lillie; Assistant Secretary and Treasurer, James Ball.

MAYOR REED, of Kansas City, Mo., has vetoed the ordinance under which the Board of Public Works was instructed to enter into a contract with the Welsbach Street Lighting Company for the maintaining of 100 street lamps, at the rate of $2.50 each per month. He bases his opposition on the ground that the price is excessive.

THE Western Gas Construction Company will place, in the Camden (N. J.) works of the South Jersey Gas, Electric and Traction Company, two Pelouze and Audouin tar extractors, each up to the passing of 4,000,000 cubic feet per diem. It is said that these will be the largest machines of the type named ever placed in America.

THE regular quarterly dividend of 1 per cent. on the shares of the Cincinnati Gas and Electric Company is payable to-morrow.

STATE Gas Inspector Leach, of Indiana, has authorized the offering of a reward of $10 to anyone who will furnish him with evidence "sufficient to convict any person, firm or corporation of violating the State law with reference to the wasting of natural gas."

MR. F. J. GREENBERG, of Newark. N. J., has been appointed Receiver for the Stern Self-Lighting Burner Company, a New Jersey corporation that was formed something over two years ago. It was capitalized in $500,000. The petition recited that the Company was "hopelessly insolvent."

A RATHER plaintive appeal is the following, which was recently addressed to the Deputy Commissioner of Street Lighting for the Borough of Brooklyn, N. Y.: "We, members of the Improvement League of the 30th Ward, an association composed of about 200 residents and property owners, living on 40th street, between New Utrecht avenue and 13th avenue, desire to call your attention to the fact that the street is without a single gas light. Fields, farms, and even cemeteries, throughout this Ward are generally well illuminated at night, but this street, containing 210 two-story houses, counting about 420 families, and representing a population of upwards of 2,000 people, is left in a dark and dangerous condition. This street has been used as a thoroughfare for not less than five years, and yet has no light on either side for the distance mentioned."

EARLY next month the Waltham (Mass.) Gas Light Company will move to its commodious new offices, 625 Main street, Central Block.

THE South Jersey Gas, Electric and Traction Company will extend its mains in the Woodbury division to the Westville-Newbold territory.

AT the annual meeting of the St. Joseph (Mo.) Gas Company the officers chosen were: Directors, W. F. Douthirt, W. A. P. McDonald, H. Wyeth, Milton Tootle, Jr., Chas. A. Pfeifer, S. C. Woodson, James Campbell, H. R. W. Hartwig and L. C. Burnes; General Manager, K. M. Mitchell. It was agreed that the main system should be extended as soon as possible to and through North St. Joseph and the Stock Yards' district of South St. Joseph.

SUPT. MERRITT, of the Niagara Falls (N. Y.) Gas and Electric Light Company, is having a busy season of it, but when his troubles in the shape of reconstruction and extension are over, he will have the satisfaction of knowing that he will be in charge of a plant as much up-to-date as the old one was behind-the-times.

THE new plant of the Rome (N. Y.) Gas, Electric Light and Power Company is in satisfactory operation.

THE Secretary of State of Illinois has assented to the application of the Peoples Gas Light and Coke Company, of Chicago, for the right to increase its capital to $35,000,000 from $30,000,000.

MR. JULIUS WITTICH has been appointed Manager of the municipal lighting plant of Alameda, Cal., vice Mr. Thos. H. Thompson, resigned.

AT the hearing before the State Board of Gas and Electric Light Commissioners, on the application of the Gloucester (Mass.) Gas Light Company for permission to increase its capital stock in the sum of $20,000, no one appeared in opposition.

MR. FREDERICK FRALEY, who, in 1834, as a member of the Common Council of Philadelphia, introduced in that body a resolution "for the appointment of a committee to consider the erection of a gas works for the purpose of lighting the city therefrom," died at his home in Philadelphia, the afternoon of the 23d inst. He was in his 98th year, having been born in Philadelphia, May 28, 1804. He was one of the founders of the Franklin Institute.

THE City Council of Elwood, Ind., has granted to the Elwood Natural Gas and Oil Company the right to build an artificial gas plant and to distribute the product therefrom through its present main system.

MANAGER BEACH, of the Passadena (Cal.) Consolidated Gas Company, has been authorized to announce a reduction in the selling rate to $1.50 per 1,000 cubic feet, the concession to date from the 1st prox.

MR. JOHN F. WILSON, who held the position of foreman of works for the Boston (Mass.) Gas Company for 42 years (or until his retirement in 1890) died at his home in Charlestown, Mass., the afternoon of the 19th inst.

MR. JOHN MARTIN, of the California Central Gas Company, and Mr. John A. Britton, of the Oakland (Cal.) Gas, Light and Heat Company, are said to be jointly interested in the proposition to establish a lighting plant in Nevada city, Cal.

AN Exchange says that the Texas Legislature has under consideration a proposition to tax the oil wells 2 per cent. on their gross output. The 2 per cent. does not seem unreasonable, though it may not be equitable when taxation on other property is considered. It is perfectly clear that the only thing about the oil land and the oil well that has real value is the oil after it has reached the surface and become a commodity. The taxation of a hole in the ground does not seem to have a basis in reason. There is a recognition of the real valuable thing by men in the character of their dealings with each other over oil lands. Rental is made a payment in kind out of the production if any. The State is proposing in a 2 per cent. tax on production, a rental in kind. If it ends with that tax, it should be satisfactory to petroleum well owners, provided that the 2 per cent. rate does not place on their property an unequal burden of taxation. Whatever question there may be is in the equality of the 2 per cent. flat tax. It would seem that 1 per cent. would come much closer to giving the industry only an equal burden as assessment undervaluation of other kinds of property are notorious. A tax rate of 2 per cent. on an assessment valuation that is only 25 per cent. of the market value of property is only equivalent to ½ per cent. on the market value. The rate of 2 per cent. on petroleum is from its nature on the market value. However, Texas petroleum producers are to be congratulated on being as rationally and reasonably treated as is proposed. They are fortunate in not having California taxation laws and assessors.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

MONDAY, SEPTEMBER 30, 1901.

The Market for Gas Securities.

Uncertainty was the ruling feature in the general share market last week, and, with the rest of the list, gas stocks were dull and lower. Consolidated closed to-day (Friday) at 218½ to 219½, and the trading in it, as has been the case since last Monday, seems to have been more apparent than real. That is, although thousands of shares since Monday have been reported sold in the regular way, the bulk of the transactions may be looked upon as of the wash sort. There is absolutely nothing new in the local situation, save that the demand for "light" has noticeably increased.

Brooklyn Union is virtually unchanged, but those who can get some of it "under 20" should have it and hold it. Peoples, of Chicago, was a feature, and it shows a gain for the week of 3 points in the bid price. Lacledes hold their own quite well, and a pronounced upward movement is recorded for Indianapolis gas. Baltimore gas seems to have sagged off materially, not so much in price as in manifest interest over its fortunes. Can it be that Mr. Dickey and his party have lost heart? The Wilmington deal is completed, the Messrs. Dobson, of Philadelphia, having announced their ownership of the property. It certainly has gone into strong hands, if they are to control its future; but later evidence may show that their interest in it is only temporary.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

SEPTEMBER 30.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$78,177,000	100	218½	219½
Central Union, Bonds, 5's	3,000,000	1,000	109	110
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	115	118
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	315	350
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.
New Amsterdam Gas Co.. Bonds, 5's	11,000,000	1,000	107¾	108
Northern Union, Bonds, 5's.	1,250,000	1,000	106	108
New York and East River.. Bonds 1st 5's	3,500,000	1,000	111	115
" 1st Con. 5's	1,500,000		109	111
Richmond Co., S. I.	348,650	50	100	..
" Bonds	100,000	1,000	103	..
Standard	5,000,000	100	130	135
Preferred	5,000,000	100	150	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	118	..
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	210	216
" " Bonds (5's)	15 000,000	1,000	116	119
Bay State	50,000,000	50	⅞	1
" Income Bonds	2,000,000	1,000	.	75
Binghamton Gas Works..	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	95	96
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	4½	6
" " Bonds, 5's	5,250,000	1,000	69	72
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Central San Francisco	2,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas & Elec. Co.	29,500,000	100	104½	104¾
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	106	107
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	60	65
Preferred	3,026,500	100	84	86
Consumers. Jersey City Bonds	600,090	1,000	102	103
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore	11,000,000	100	63½	64
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's.	1,000,000	..	..	..
Equitable, 1st 6's.	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	12	14
" Con. Mtg. 5's	880,000	1,000	79	83
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50		89
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	381,000	1,000	89	89½
" Inc. 5's	16,000	100	94	94½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	34	38
Fort Wayne	2,000,000	..	..	.
" Bonds	2,000,000	..	50	54
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	102	104
Hartford	750,000	25	240	250
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	60	63
" Bonds, 6's	2 650,000	..	100	..
Jackson Gas Co	250,000	50	65	70
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	90	93
Preferred	2,500,000	100	101	102
Bonds	10,000,000	1,000	..	108½
Lafayette Gas Co., Ind	1,000,000	100		60
Bonds	1,000,000	1,000	48	55
Louisville	2,570,000	50	110	120
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	102½	108
" 6 per cent. scrip, due 1910	100,000	25	87	89
Montreal, Canada	2,000,000	100	182	184¾
Newark, N. J., Con. Gas Co Bonds, 6's	6,000,000	..	..	55
	4,600,000	..	..	103
New Haven	1,000,000	25	300	325
Nashville Gas Lt. Co.	1,000,000	100	110	..
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	107	107½
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	
Rochester Gas & Elec. Co..	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	46	46½
St. Paul Gas Light Co	1,500,000	100	60	63
1st Mortgage 6's	650,000	1,000	82	85
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's	2,465,000	1,000	86	88
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	93	96
Syracuse, N. Y.	1,750,000	100	16	17
Bonds	1,612 000	1,000	91	93
Washington, D. C	2,600,000	20	307½	310
First mortgage 6's	600,000	..	..	..
Western, Milwaukee. Bonds, 5's	4,000,000	..	107	108½
Wilmington, Del.	600,000	50	232	..

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Practical Handbook on Gas Engines 557
Hughes' "Gas Works" 551
Binders 551
Scientific Books 550

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO., N. W. CORNER BROAD AND ARCH STS., PHILADELPHIA, PA., Sept. 11, 1901.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable Oct. 15th, 1901, to stockholders of record at the close of business, Sept. 30. Checks will be mailed.

1871-5 LEWIS LILLIE, Treasurer.

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As Working Superintendent or Assistant Foreman,

By a man 27 years of age. Understands laying mains and services, reading, setting and repairing meters, gasfitting, complaint work and the selling and adjusting of all kinds of gas appliances. Competent in the manufacture and distribution divisions of a gas works. Best of references from leading gas men of the Southwest.

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Of over 18 years' experience, the position of Superintendent. Has had the management of coal, water and oil gas works in the North, South and Middle States. Has practical knowledge of gasfitting, making meter connections, testing meters, laying mains, service work, selling and setting stoves, soliciting new business, and office work. Is competent to take charge of the construction, manufacture and distribution divisions of a gas plant sending out 6,000,000 to 12,000,000 cubic feet or over per annum. Best of references.

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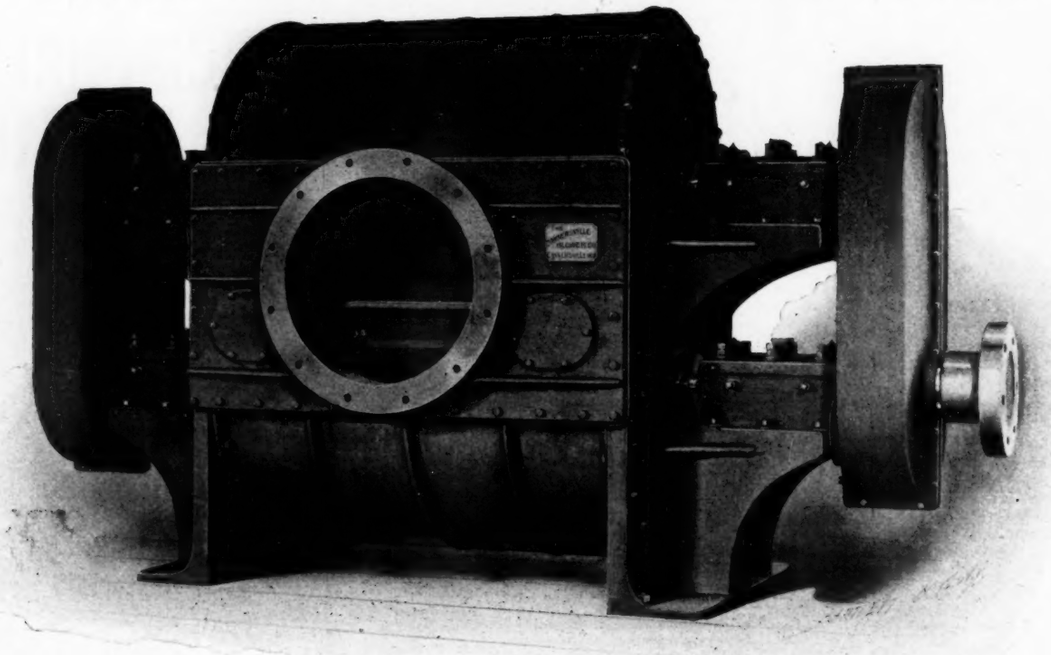

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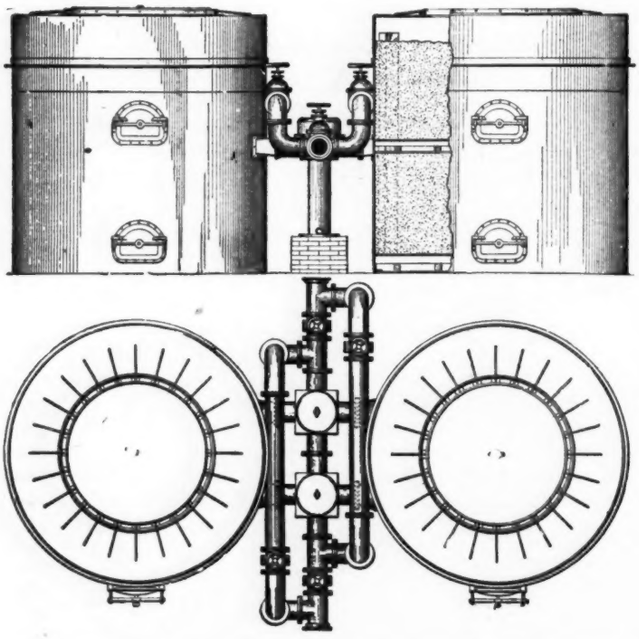

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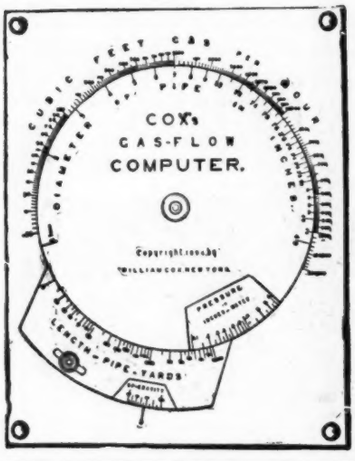

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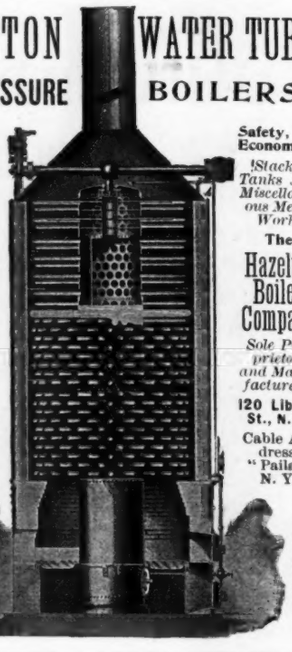

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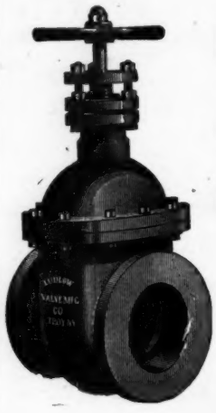

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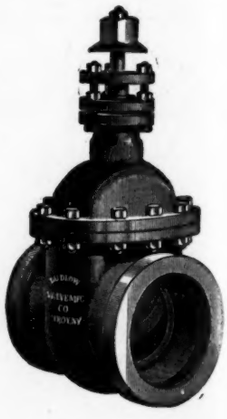

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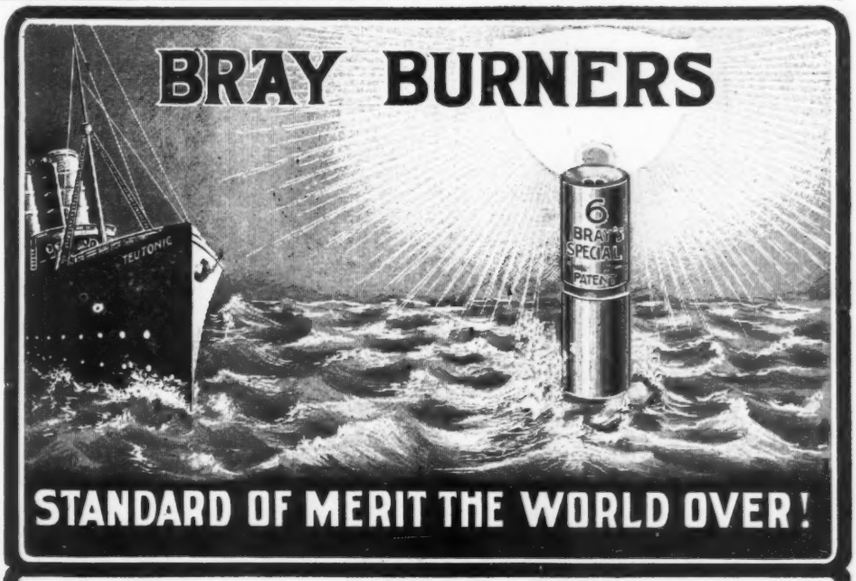

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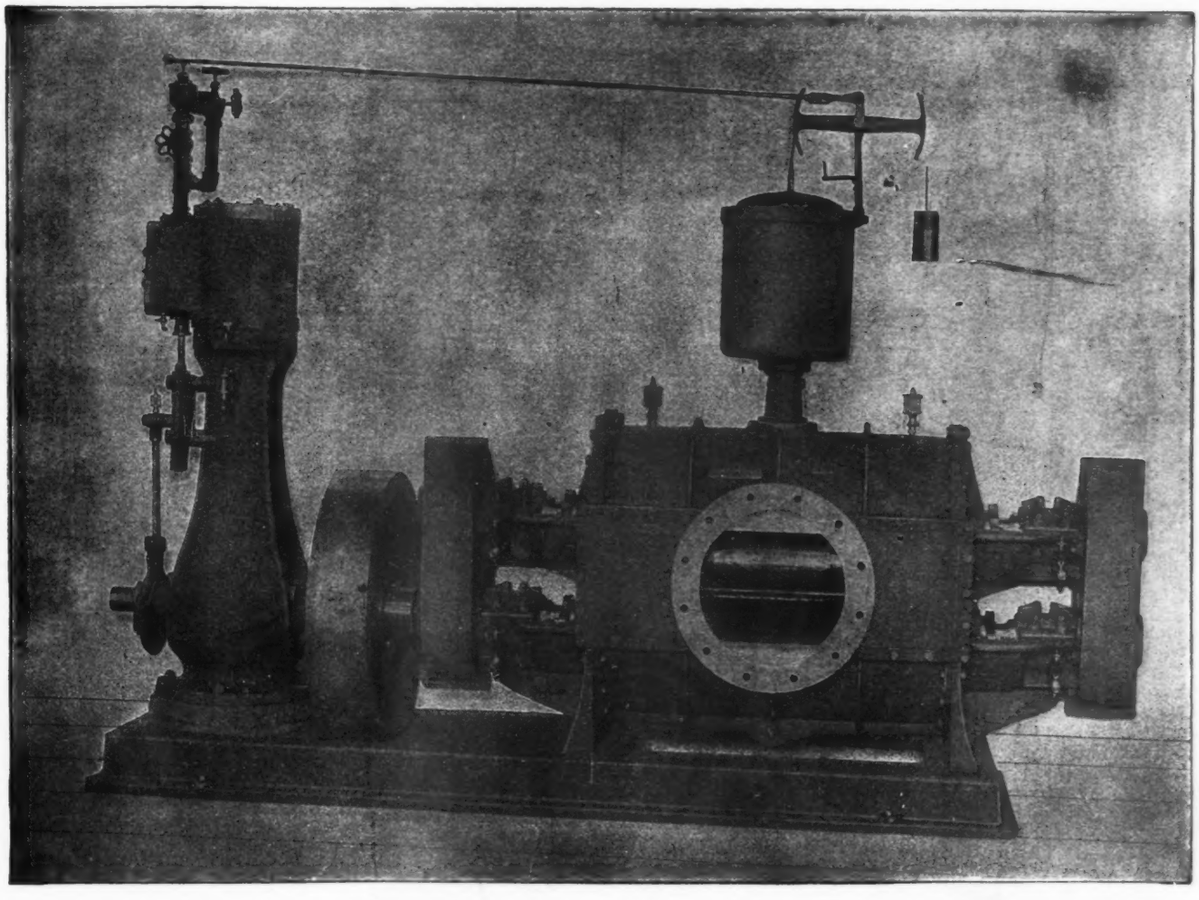

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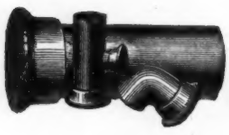

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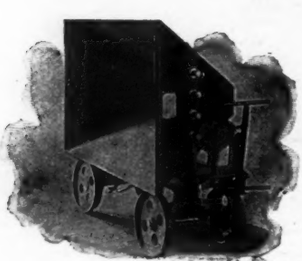

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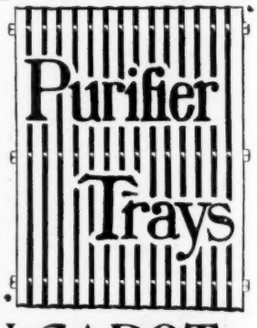

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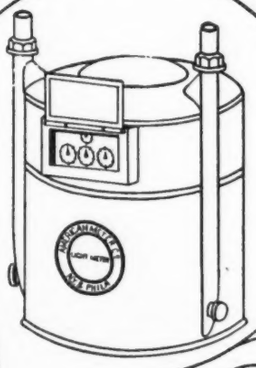

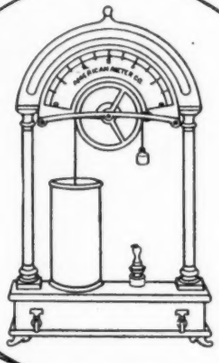

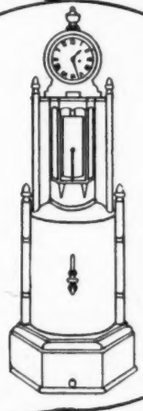

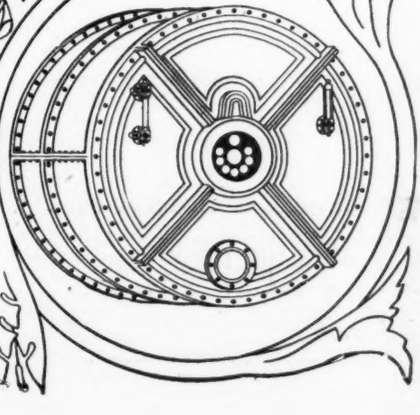

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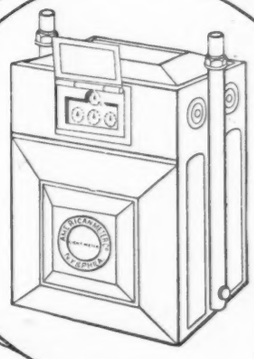

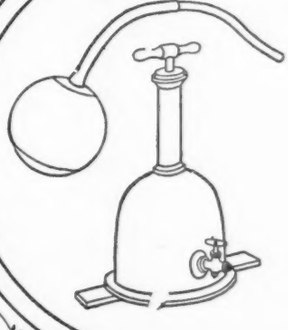

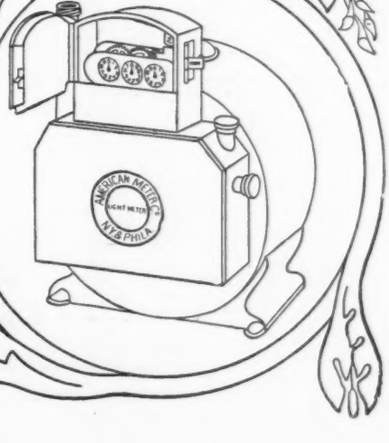

PUBLIC LIGHTING TABLE.

OCTOBER, 1901.

Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Tue.	1	6.10 PM	9.10 PM	5.30	5.00
Wed.	2	6.10	10.00	5.30	5.00
Thu.	3	6.10	11.00	5.30	5.00
Fri.	4	6.10 LQ	12.10 AM	5.30	5.00
Sat.	5	6.10	1.10	5.30	5.00
Sun.	6	6.00	2.10	5.30	5.00
Mon.	7	6.00	3.10	5.30	5.00
Tue.	8	6.00	4.20	5.20	5.10
Wed.	9	6 00	5.00	5.20	5.10
Thu.	10	6.00	5.00	5.20	5.10
Fri.	11	6.00	5.00	5.20	5.10
Sat.	12	6.00 NM	5.00	5.20	5.10
Sun.	13	5.50	5.10	5.20	5.10
Mon.	14	5.50	5.10	5.20	5.10
Tue.	15	5.50	5.10	5.10	5.20
Wed.	16	5.50	5.10	5.10	5.20
Thu.	17	7.40	5.10	5.10	5.20
Fri.	18	8.30	5.10	5.10	5 20
Sat.	19	9.30	5.10	5.10	5.20
Sun.	20	10.30 FQ	5.20	5.10	5.20
Mon.	21	11.30	5.20	5.10	5.20
Tue.	22	12.30 AM	5.20	5.00	5.30
Wed.	23	1.40	5.20	5.00	5.30
Thu.	24	2.50	5.20	5.00	5.30
Fri.	25	4.00	5.20	5.00	5.30
Sat.	26	No L.	No L.	5.00	5.30
Sun.	27	No L. FM	No L.	5.00	5.30
Mon.	28	No L.	No L.	5.00	5.30
Tue.	29	5.30 PM	7.50 PM	4.45	5.35
Wed.	30	5.30	8.50	4.45	5.35
Thu.	31	5.30	9.50	4.45	5.35

TOTAL HOURS LIGHTING DURING 1901.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	220.10	January	423.20
February	192.30	February	355.25
March	180.00	March	355.35
April	158.30	April	298.50
May	140.40	May	264.50
June	135.40	June	234.25
July	138.00	July	243.45
August	156.20	August	280.25
September	174.40	September	321.15
October	202.30	October	374.30
November	220.40	November	401.40
December	241.30	December	433.45
Total, yr.	2161.10	Total, yr.	3987.45

NEW YORK, 33 Nassau Street. PHILADELPHIA, Broad and Arch Streets. CHICAGO, Foot of Orleans Street. BOSTON, 624 Tremont Building.
CLEVELAND, 809 Cuyahoga Building. ST. LOUIS, 712 Roe Building. SAN FRANCISCO, 712 Polk Street.

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.... OF AMERICA ....

No. 36.

Controls and Operates the

Welsbach System of Street Lighting,

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

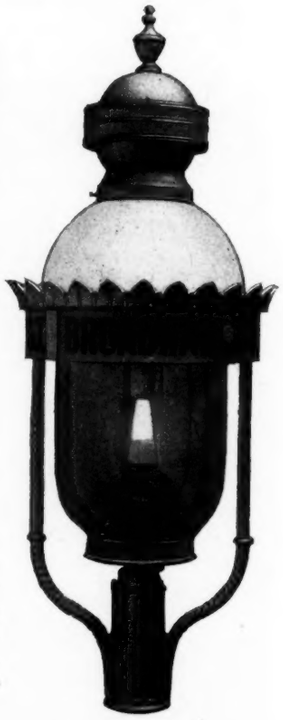
POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others Interested in Municipal and Outside Lighting.

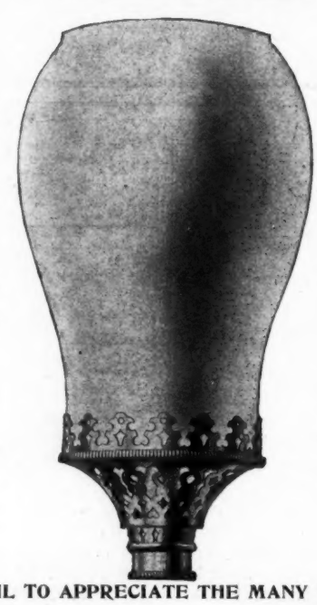


No. 38.

UNIVERSAL WELSBACH BURNER.

The most practical, efficient and artistic burner yet produced. . . . . .

It contains an improved adjustable Bunsen so constructed as to permit of a wide range of variations in gas pressure without blackening the mantles and without an adjustable air shutter. . . . . .



It can be used with all styles and sizes of glassware, either shades or globes. No further necessity to carry a stock of different burners for the many sizes and shapes of glassware. .

GAS COMPANIES AND DEALERS CANNOT FAIL TO APPRECIATE THE MANY SALABLE FEATURES OF THIS NEW BURNER.

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GLOUCESTER, N. J. CHICAGO, ILLS.

Salesrooms in all the Leading Cities of the United States.

THE STANDARD DOUBLE SUPERHEATER

LOWE WATER GAS APPARATUS.

Under Contract, 1901:

Number of Sets to August 1, 1901, - - - - - - - 27

Total Daily Capacity, - - - - 28,200,000 Cubic Feet.

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Established 1858. Incorporated 1890.
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Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

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Fire Brick Manufg. Co.,

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RETORT SETTINGS

Water Gas Cupola Linings, Fire Clay, Etc.

Proprietors for the U. S., Coze System of Inclined Benches.

Estimates Furnished on Application for Most Successful Style of Construction.

Also for Free-Firing and Full and Half-Depth Regenerative Benches, for Burning either Coal or Coke in the Furnaces.

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Modern Recuperative Furnaces.

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(ESTABLISHED 1856.)

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BENCH SETTINGS,
Fire Brick, Tiles, Etc.

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In Kegs, 100 to 200 " " 6 " "
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CITY OFFICE,
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We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We construct

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Containing 6, 8 or 9 Retorts.

We have Greatly Improved our Recuperators. Coal or Coke can be used as Fuel in Furnaces.

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FIRE BRICK, FIRE CLAY, AND FIRE CEMENT.

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Sole Agents for New England States.

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CORRESPONDENCE IS RESPECTFULLY SOLICITED.

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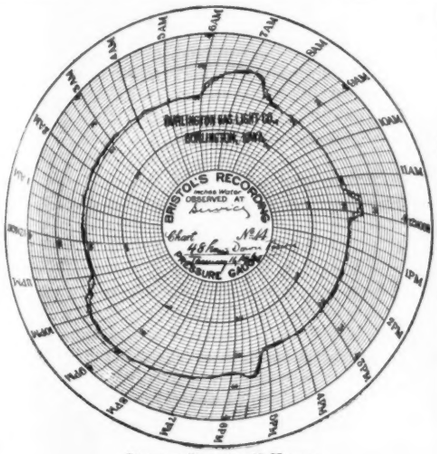
A GAS GOVERNOR,

Particularly a CONNELLY Gas Governor,

Is as essential to the operation of a gas works as the Governor of any of our great States is necessary to the successful working of one of these political bodies.



DOUBLE RECORD 48 HOURS.

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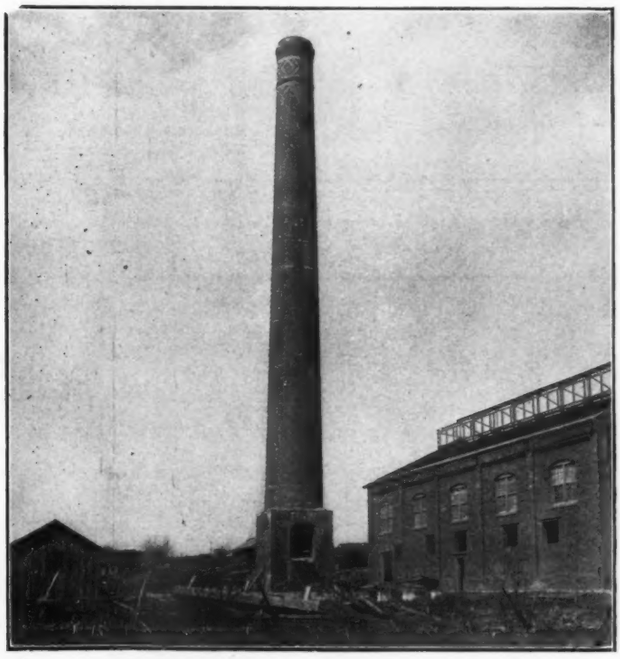
Manhattan Fire Brick & Enameled Clay Retort Works,

Designers and Builders of Chimneys of Perforated Radial Bricks.



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STRICTLY High Grade. . . . .
Carefully prepared.
For Gas Making or
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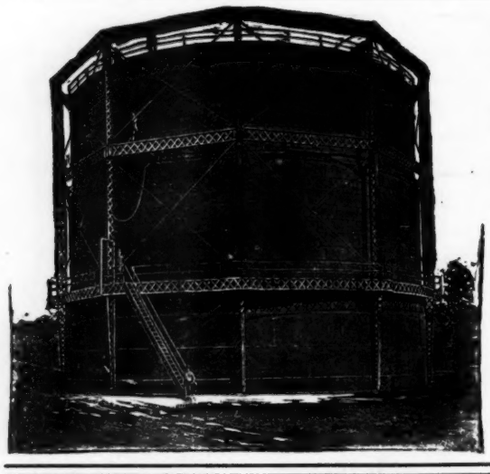

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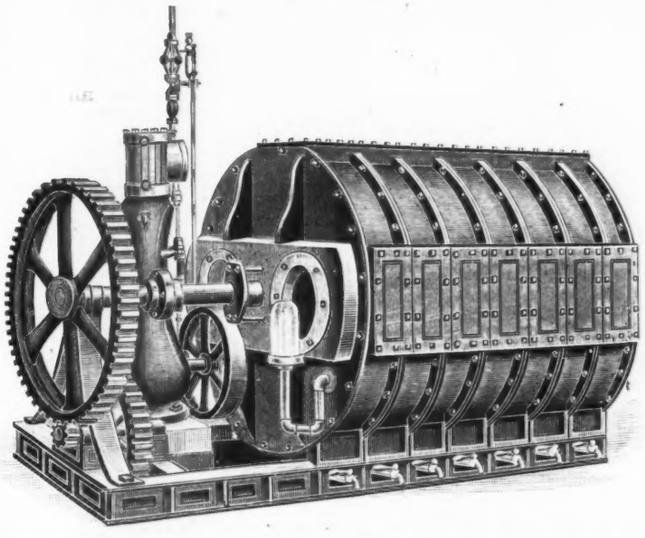

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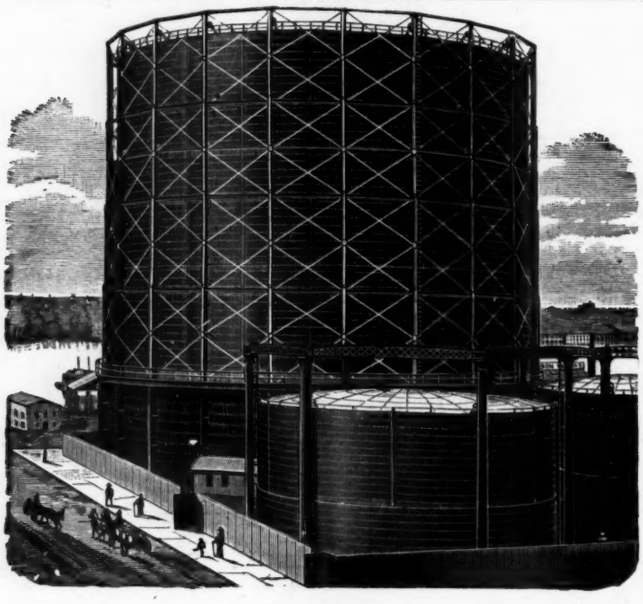

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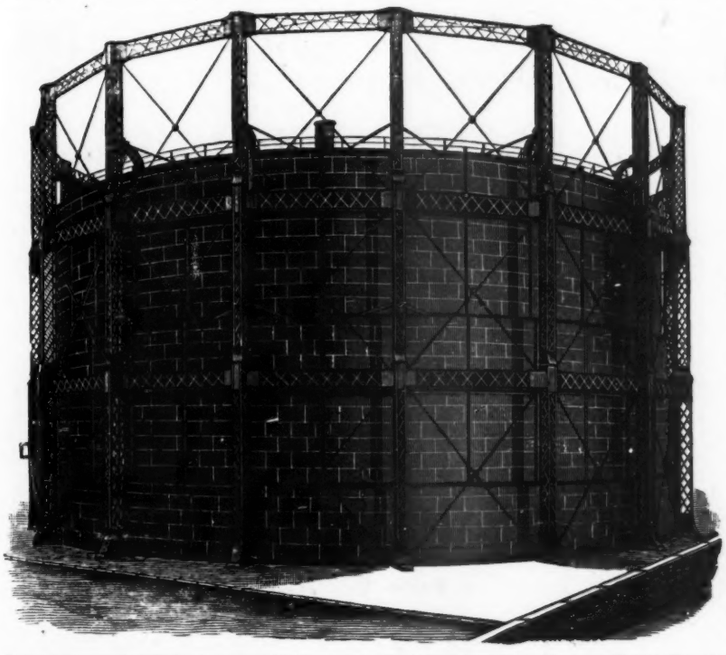

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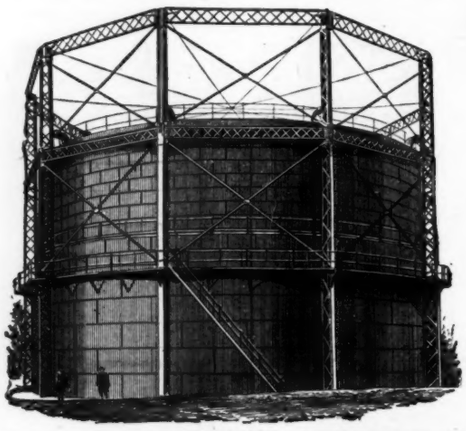

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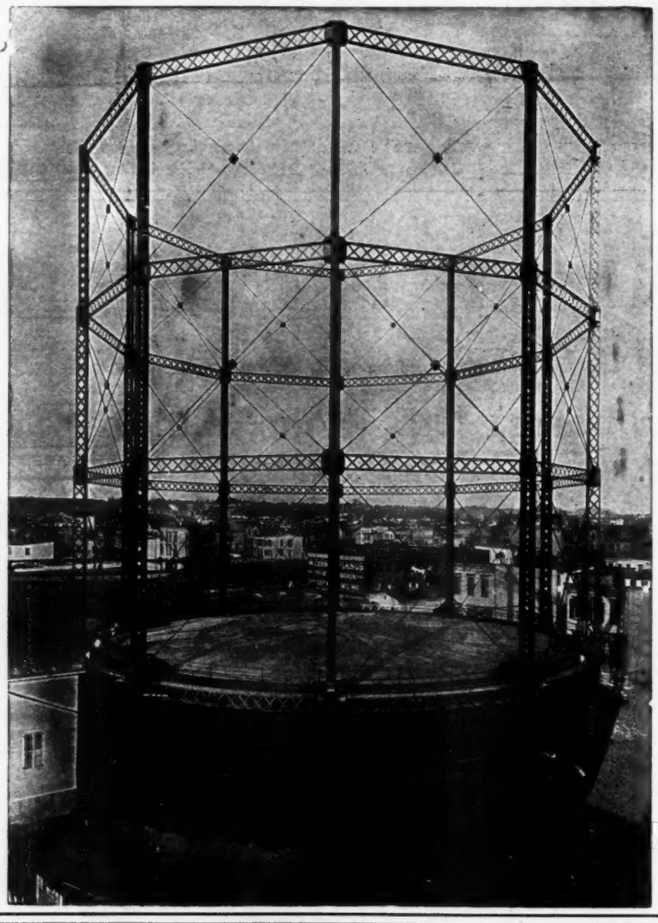

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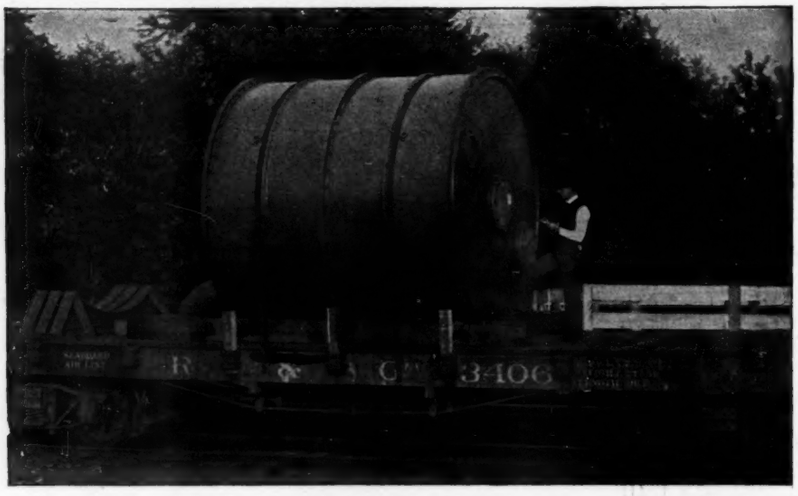

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